Advantech Wireless

SBM75e Series Modulator

L-Band Satellite Modulator

32 k – 45 M Symbol
BPSK/QPSK /8PSK/16APSK/32APSK

Installation and Operation Manual

Version 1.1

March 2009

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Preface

Thank you for purchasing a Modulator from Advantech AMT. These products build on the success of the SL/QD series, the industry's first L-band digital satellite modems. Advantech Advanced Microwave Technology is an international company specializing in the development of satellite communication systems.

The following information provides the document part number, revision, the copyright notices, along with the pertinent FCC, English, German, and French compliance, and the serviceability of the Modulator.

Document Revision

Revision	Date	Content/Modifications
1.0	November 2008	First Issue.
1.1	March 2009	Added all ACM/VCM content

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Customer Support

The staff at Advantech AMT is committed to producing the highest quality products and may be contacted for product service, support and assistance at the following locations:

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You can also visit our website at http://www.advantechamt.com

Warranty and Service

Advantech AMT warrants to the Purchaser that the Products and any Repaired Products (Repairs) will be free from defects in material and workmanship for a period of two years from the date of shipment to the Purchaser.

Advantech AMT's obligation under this warranty is limited to replacing or repairing, at ADVANTECH AMT's option, Products or Repairs found by Advantech AMT to be defective within the warranty period. All such replacements and repairs shall be performed at facilities designated by ADVANTECH AMT and shall be performed only after the customer has received a Return Material Authorization (RMA) number from Advantech AMT and has returned the Product to Advantech AMT, shipping and insurance prepaid by Purchaser.

The returned Product must be accompanied by the customer's name, address and telephone number, the model and serial number of the Product, a statement of the purchase date and a detailed description of the problem. Products and Repairs returned by Purchaser shall be repaired by ADVANTECH AMT using new or refurbished parts and shall be returned to Purchaser by ADVANTECH AMT, shipping prepaid by ADVANTECH AMT.

This warranty shall immediately become null and void if, in ADVANTECH AMT's sole judgement, the Product has been subject to unauthorised modification, misuse, abuse, neglect, accident, improper installation or application, alteration or neglect in use, storage, transportation or handling, or if the serial number and/or other Product markings have been removed, defaced or altered.

ADVANTECH AMT may, at its discretion, perform out-of-warranty repairs at ADVANTECH AMT facilities in exchange of customary charges, or offer a written agreement extending the terms of this warranty at a price stated in such agreement. All repairs performed out of warranty or pursuant to an extended warranty agreement shall be subject to all of the applicable limitations and procedures of this Agreement.

The above warranties are in lieu of all other warranties, expressed, implied, or statutory or arising by custom of trade usage, including any warranty of merchantability of fitness for any unique, special or express purpose, and of all other obligations of liabilities whether in contract, tort or otherwise including, without limitation, liability for damages (whether general or special, direct or indirect, consequential, incidental, exemplary) or any claim for the loss of profits or business or for damage to goodwill.

Extended Warranty Options

Please contact Customer Service or your reseller for information on optional extended warranties.

Service

To return a Product for service or repair, obtain an RMA number from ADVANTECH AMT's Customer Service Department.

The following information will be requested:

- Customer name, address, telephone number
- Model number
- Serial number
- Detailed description of problem

All customer-returned units must be shipped to ADVANTECH AMT freight prepaid, in the original carton or equivalent. ADVANTECH AMT is not responsible for damage in transit.

ADVANTECH AMT will accept only completely assembled units for repair.

Safety Notices

Radio Frequency (RF) Interference

This equipment generates, uses and can radiate radio frequency energy, and, if not installed in accordance with the instructions contained herein, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of the Federal Communications Commission rules, which are designed to provide reasonable protection against such interference, when operating in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference. In this case, the user is required to take whatever measures are necessary to correct the interference at the user's expense.

If radio frequency interference is encountered after the installation of this equipment, corrective measures are required to reduce the interference. Information on recommended measures can be obtained from the manufacturer.

United Kingdom

WARNING

1. **TO ENSURE ADEQUATE COOLING OF THE EQUIPMENT, A 2.0-INCH UNOBSTRUCTED SPACE MUST BE PROVIDED AROUND ALL SIDES OF THE UNIT.**
2. **THE AC POWER SOCKET SHALL BE INSTALLED NEAR THE EQUIPMENT AND SHALL BE EASILY ACCESSIBLE.**
3. **REMOVE POWER PLUG FROM THE POWER SOCKET BEFORE PERFORMING ANY SERVICE WORK ON THE UNIT.**
4. **ONLY FACTORY AUTHORIZED SERVICE PERSONNEL SHOULD PERFORM SERVICE ON THIS UNIT. FAILURE TO OBSERVE THIS WARNING CAN RESULT IN MALFUNCTION TO THE UNIT AS WELL AS ELECTROCUTION TO PERSONNEL.**

France

AVERTISSEMENT

1. **AFIN DE NE PAS NUIRE AU PROCESSUS DE REFROIDISSEMENT, IL EST NÉCESSAIRE DE LAISSER UN ESPACE D'ENVIRON 5 CM DE CHAQUE CÔTÉ DE L'APPAREIL.**
2. **PLACEZ L'APPAREIL PRÈS D'UNE PRISE DE COURANT FACILEMENT ACCESSIBLE.**
3. **DÉBRANCHEZ L'APPAREIL AVANT DE L'OUVRIR.**
4. **CET APPAREIL NE PEUT ÊTRE EXAMINÉ OU RÉPARÉ QUE PAR UN EMPLOYÉ AUTORISÉ DU FABRICANT. SI CETTE CONSIGNE N'EST PAS RESPECTÉE, IL Y A RISQUE DE PANNE ET/OU D'ÉLECTROCUTION.**

Germany

VORSICH

1. **UM DIE KÜHLUNG DES GERÄTES NICHT ZU BEEINTRÄCHTIGEN, IST ES NOTWENDIG, AN ALLEN SEITEN DES GERÄTES CA. 5 CM RAUM ZU LASSEN.**
2. **STELLEN SIE DAS GERÄT IN DER NÄHE EINES GEERDETEN SCHUTZKONTAKTSTECKERS SO AUF, DASS DER STECKER LEICHT ERREICHBAR UND ZUGÄNGLICH IST.**
3. **VORM ÖFFNEN DES GERÄTES MUSS DER NETZSTECKER VOM STROMNETZ GETRENNT WERDEN.**
4. **DIESES GERÄT DARF NUR DURCH DAS BEVOLLMÄCHTIGTE KUNDENDIENSTPERSONAL DER FABRIK INSTANDGEHALTEN WERDEN. DIE NICHTBEACHTUNG DIESER VORSCHRIFT KANN ZU FEHLFUNKTIONEN DES GERÄTES FÜHREN UND DAS PERSONAL DURCH STROMSCHLÄGE GEFÄHRDEN.**

Contents

Chapter 1 Getting Started

Describes the function of the equipment and its purpose within the system. It also provides a guided tour of the base unit front and rear panel controls, indicators and connectors.

Chapter 2 Installation

Details the procedures for installing the equipment, including important safety information, details the base unit connectors and cables.

Chapter 3 Front Panel Monitoring & Control

Describes how to configure the unit using the front panel display.

Chapter 4 Web GUI Monitoring & Control

Describes how to configure the unit using the Web Graphical User Interface.

Appendix A Technical Specification

Details the technical specification for the equipment, including performance, signals, power, physical, environmental and standards compliance.

Appendix B Glossary

Provides a description of the abbreviations ands terms used in this manual.

CHAPTER 1: Getting Started

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1.1 Scope of this Manual

1.1.1 Who Should Use This Manual

This manual is intended for operators/users of the SBM75e of Network L-Band and 70/140 MHz Satellite Modulators to assist in the installation, operation, fault-finding and maintenance of the equipment. Throughout this manual, this product is referred to as the 'SBM75e Modulator '.

WARNING

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY ADVANTECH AMT TRAINED PERSONNEL AND APPROVED SERVICE ENGINEERS ARE PERMITED TO SERVICE THIS EQUIPMENT.

Caution

Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This Installation and Operation Manual does not include any procedures which require the removal of any equipment covers.

1.1.2 Version Information

This manual has been written to cover **Software Version 1.0.7** and later.

1.1.3 Equipment Covered by this Manual

This manual covers the SBM75e L-Band Satellite Modulator (16" unit) and the L-Band and 70/140 MHz Satellite Modulator (20" unit).

1.1.4 RF/IF Interface Options

The SBM75e Modulator is provided with the following outputs:

- L-Band (950 – 2000 MHz)
- IF (70/140 MHz)

1.1.4.1 Modulator L Band Output

The L-Band output signal is presented on the rear panel of the Modulator (BNC female, 50Ω). If the Modulator has been ordered with the BUC power option then the DC voltage is switched onto the inner conductor of this connector. When installing the Modulator to the system, BUC power should be turned off.

1.1.4.2 Modulator IF Output

The IF output signal is presented on the rear panel of the Modulator (BNC female, 50Ω).

Caution

With BUC power enabled, there is a potentially damaging DC voltage applied to the Modulator output. When connecting test equipment, or a local Modulator (or any DC coupled devices), always use appropriate DC blocks, and disable BUC powering.

1.2 Summary of Features

1.2.1 Overview

The SBM75e Modulator supports all the major satellite standards, both Intelsat and DVB, in a one rack unit chassis, if the appropriate options are enabled.

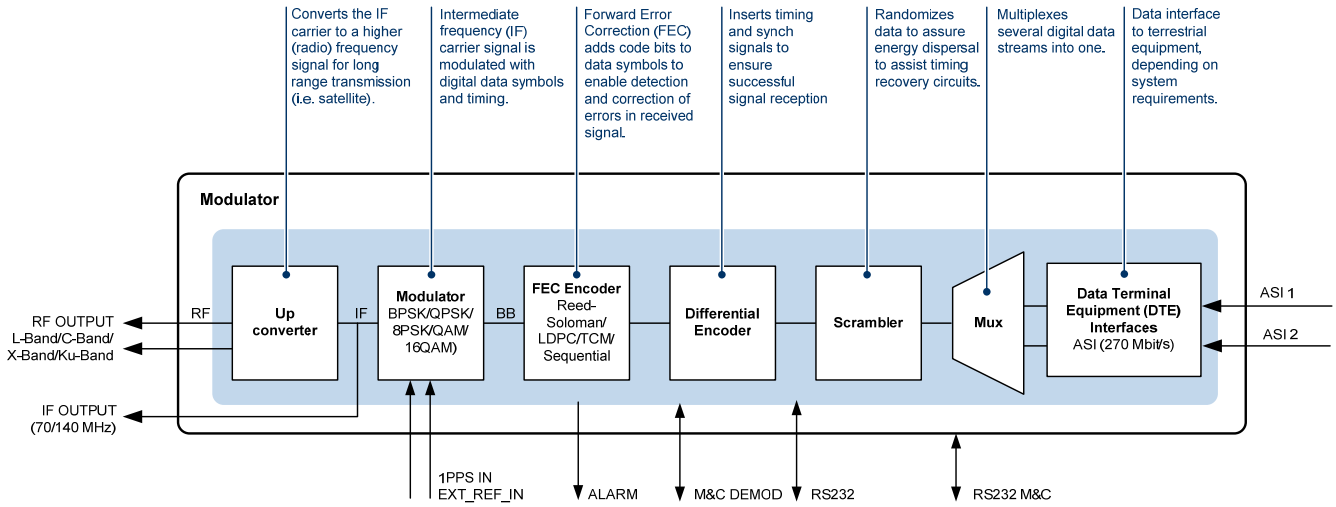


Figure 1.1: SBM75e Modulator Block Diagram

1.3 Guided Tour

1.3.1 Enclosure

The SBM75e Modulator can be fitted into a 1U high enclosure and may be used on a desktop or rack mounted.

1.3.2 Front Panel Description

The SBM75e Modulator is provided with a VFD 40 x 2 character display, 7 status LEDs and a 16 button keypad.

Figure 1.2: SBM75e Modulator Front Panel

1.3.2.1 Vacuum Fluorescent Display (VFD)

The VFD can display two lines of up to 40 characters each and has a wide viewing angle.

1.3.2.2 LED Indicators

The LEDs on the front panel indicate the summary status of major Modulator conditions. LEDs that illuminate GREEN indicate that the function is in operation. LEDs that illuminate RED indicate a fault condition.

Figure 1.3: Front Panel LED Indicators

Table 1.1: SBM75e Front Panel LEDs

LED Name	Colour	Description
BUC Power	Green	Indicates that the BUC power is enabled
LNB Power	Green	Indicates that the LNB power is enabled
Transmit On	Green	Indicates that the Modulator is transmitting
Receive 1 Fault	Red	Indicates that the Demodulator channel is not locked to a received signal
Receive 2 Fault	Red	Reserved
Transmit Fault	Red	Indicates that the Modulator is not transmitting due to a fault (or user intervention)
Prime Power	Green	Indicates that the power supply current is being received by the management card

1.3.2.3 Keypad

The front panel 16-button keypad allows for navigation of the display and data input.

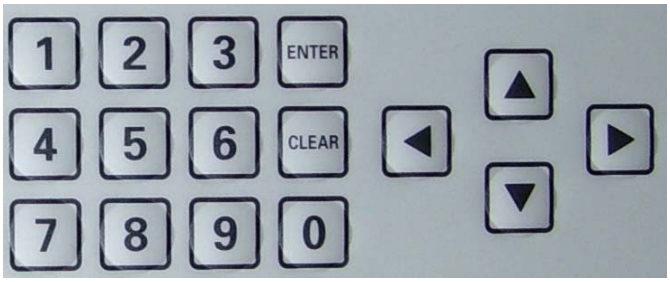


Figure 1.4: Front Panel Keypad

Table 1.2: Front Panel Keypad Functions

Keys	Description
ENTER	This key will enter a submenu or enter an editing mode of a parameter. The Parameter is only set once ENTER is pressed again otherwise changes will not be saved. Commands such as reconfigure and reset will activate once the ENTER key is pressed.
CLEAR	This Key will return to the previous display or exit out of an editing mode without changing the parameter.
▲▼	These keys are used to navigate the menus. The → symbol on the display is used to point to the current selection. The ↓↑symbols on the display indicate options above and below. On some menus with a large number of options then the selection will wrap around. These keys can also be used when editing parameters either from a list or numerically incrementing or decrementing values including hexadecimal. When a parameter requires a +/- indicator then these keys are used to toggle between them.
◀▶	These keys are used to navigate a parameter value once it has been selected. The ▶ key will also enter a submenu in the same way as the ENTER key.
0 to 9	When editing a parameter field with a numerical value, these keys allow the number to be entered directly.

Note

If a parameter is changed and the CLEAR key pressed before ENTER, the parameter change will be cancelled and the display returned to parameter selection mode.

1.3.3 Rear Panel Description

The SBM75e Modulator rear panel provides a number of connectors Further details, including pin-outs are described in *Chapter 2, Installation*

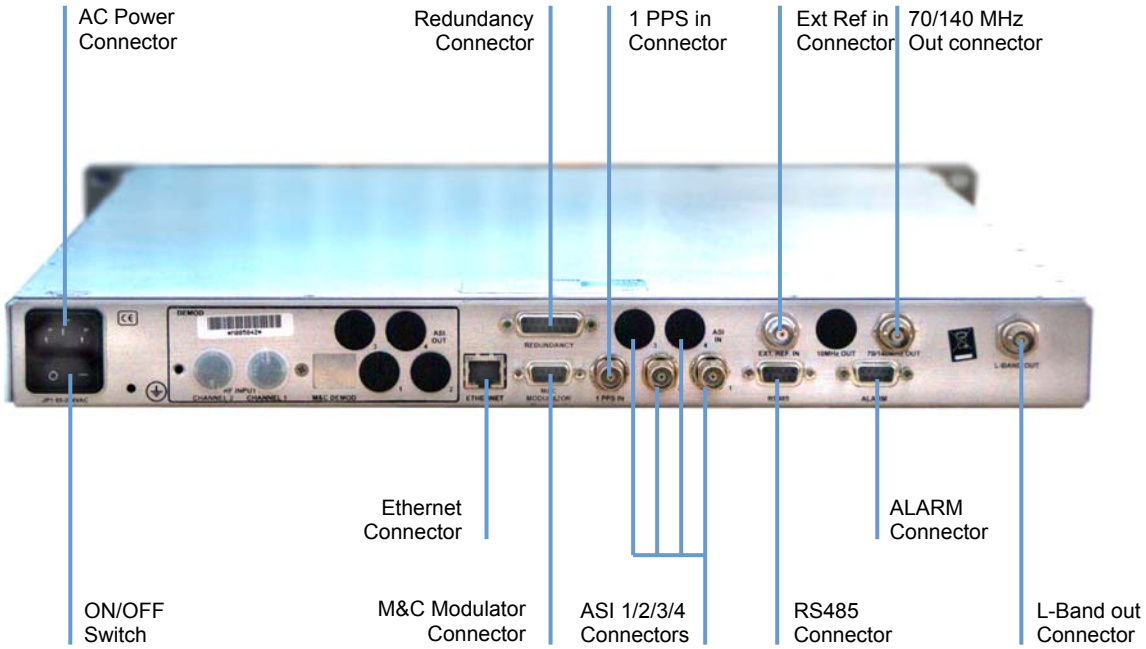
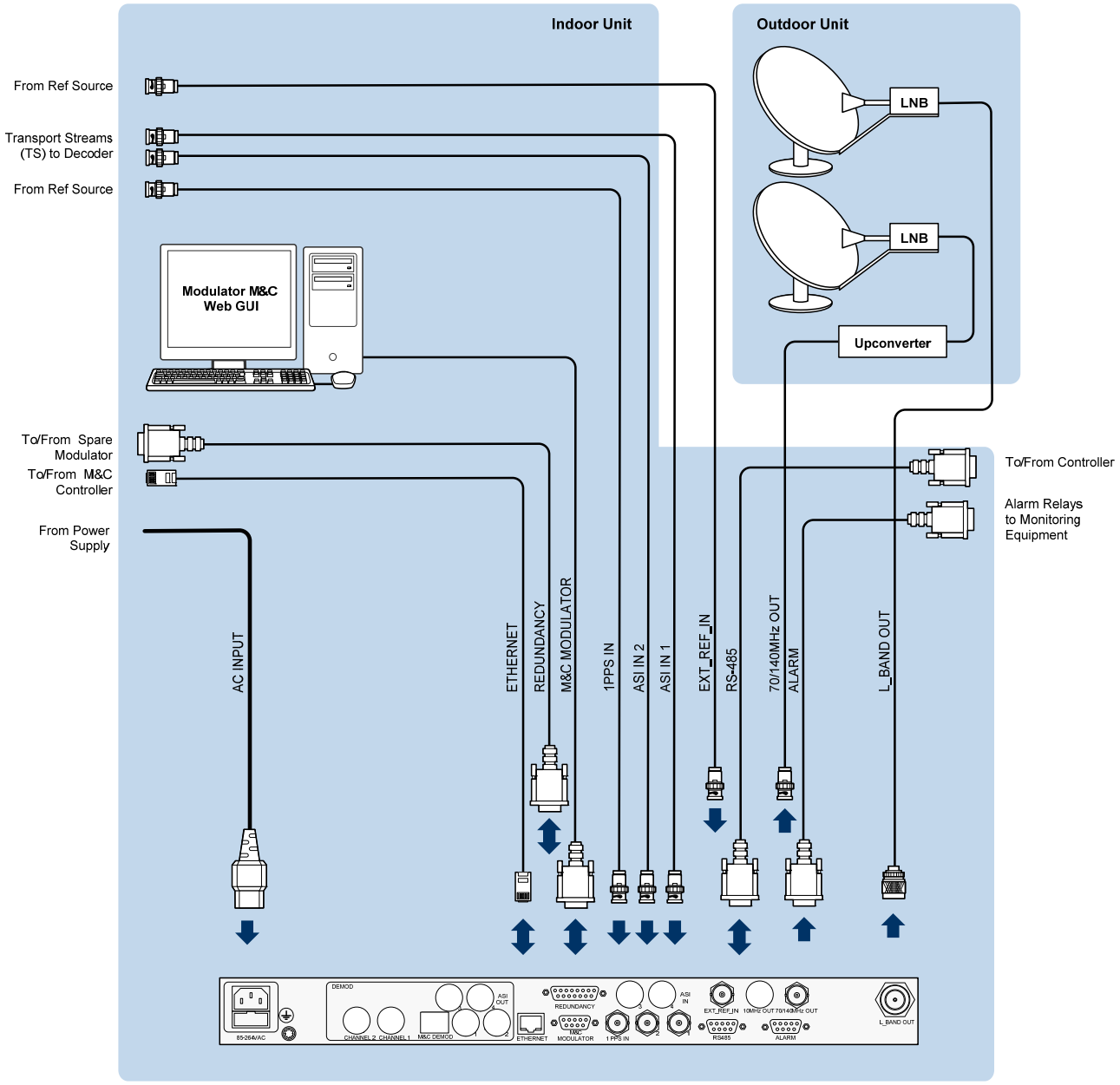


Figure 1.5: SBM75e Modulator Rear Panel

1.4 Typical System Setup

The following diagram shows a typical system setup and signal interconnections. For detailed connector information, see *Chapter 2, Installation*.



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2.1 Introduction

This chapter describes the unpacking, inspection and installation considerations.

2.1.1 Read This First!

The SBM75e Modulator must be handled carefully and thoughtfully to prevent safety hazards and damage. Ensure the personnel designated to install the unit have the appropriate skills and knowledge. If in any doubt, contact Advantech AMT Customer Support.

Follow the instructions for installation and only use installation accessories recommended by the manufacturers.

2.1.2 General

Advantech AMT personnel normally perform installation of the SBM75e Modulator. This chapter provides configuration and connection information for planning installations, checking the final set-up in the event of a fault, modifying the requirements or moving the equipment to another location. In the event of problems, contact Customer Support.

2.1.3 Site Requirements

2.1.3.1 Power Supplies

See *Appendix A, Technical Specification* for a full specification.

2.1.3.2 Environment

See *Appendix A, Technical Specification* for a full specification.

Do not install this product in areas of high humidity or where there is danger of water ingress.

The installation site should be compatible with the location used for other electronic equipment. That is, the building should be free from excessive dust and moisture. The room should not exceed the recommended temperature range (defined in *Appendix B Technical Specifications).* The installation location should allow for ample airflow. Also, allow extra room for service access to cables and wiring.

2.1.4 EMC Compliance Statements[1]

2.1.4.1 EN 55022

This equipment is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2.1.4.2 FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

[1] The EMC information was correct at the time of manufacture. The EMC tests were performed with the Technical earth attached.

2.2 Preliminary Checks

2.2.1 Mechanical Inspection

When taking delivery of an SBM75e Modulator, check the equipment items delivered against the enclosed delivery note. Inspect the equipment for damage in transit. If in doubt, contact Customer Support (see *Preliminary Pages*).

NOTE...

Do not remove the covers of this equipment as doing so may invalidate any warranties, cause a safety hazard and/or affect the EMC performance. It may also invalidate any safety tests. Check with Customer Support beforehand.

2.2.2 Moving the Equipment Safely

Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury and serious damage to the product. Use only with a cart, stand, bracket or table recommended by Advantech AMT

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

Do not move or carry the equipment whilst it is still connected to the supply or other leads, is live or is in operation.

2.3 Unpacking and Inspection

Check for damage to the outside and the inside of the shipping container. If there is any damage, contact Customer Service and the shipping carrier to report it.

2.3.1 Unpacking

To insure safety and proper operation of this equipment, use the following unpacking and repackaging guidelines:

- The equipment is shipped in a high-quality cardboard container and packed with high-density moulded foam. This type of packing material can withstand impairments such as vibration and impact associated with long-distance shipment. The packing box and foam is the only suitable type of packing that should be used for shipping the equipment.
- While unpacking, observe how the equipment is packed. In order to avoid damage, it must be repackaged in exactly the same manner if you need to ship the unit to another location or return it to the factory.

The packing consists of one large cardboard box, two foam side caps, and one accessory box. Please retain these items for future use

2.3.2 Inventory

Take inventory of the complete package to ensure that all necessary parts are present. A quick review of your pre-installation site survey form, purchase order, and shipping list should reveal any discrepancies. The box should contain the modulator, a power cord, a fan filter kit, and this manual. If any additional kits have been ordered such as the Rear Support Kit verify the contents using the packing slip

2.4 Installing the equipment

Move the unit to the location where it will be installed. Ideally, the unit will be installed into an equipment rack or a shelf. Prior to installing the SBM75e Modulator, determine the depth of the supporting structure. A Rack Mount Support Kit may be required (if this has not been supplied with your modulator when purchased, see *Preliminary Pages* for ordering information. If necessary, prior to installation into the rack or shelf, remove the three coloured screws on the bottom side of the chassis. The removal of these screws frees up the anti-vibration mount that was secured during shipping. Install the fan filters onto the external fans, if a regular maintenance schedule can be provided to clean or replace the fans. Do not install the filters at a remote location unless quarterly preventative maintenance is performed. Follow the additional precautions shown below:

- Do not block the air holes or the fan cut outs the back panel of the unit. These openings must be kept clear for the proper cooling of the equipment.
- Do not place the units beside each other or on top of each other. The exhaust from one unit can be drawn into the air intake of another.

  Make sure the room is properly cooled. Normal cooling may not be sufficient for locations where the electrical equipment is installed.
- Always make sure the unit's top cover is installed and secured in place.
- If it has not already been done, label each cable that will be attached to the unit. This will prevent confusion and ensures proper connection.

2.4.1 Modulator Rack Mounting Support Kit

Rack support kits are available to secure the SBM75e Modulator securely into the supporting structure. See *Table 2.1* for details of the kit required for various rack sizes.

Table 2.1: SBM75e Modulator Rack Mounting Support Kits

Rack Depth	Kit
600mm	19A-230001-001
700mm	19A-230021-001
800mm	19A-230011-001

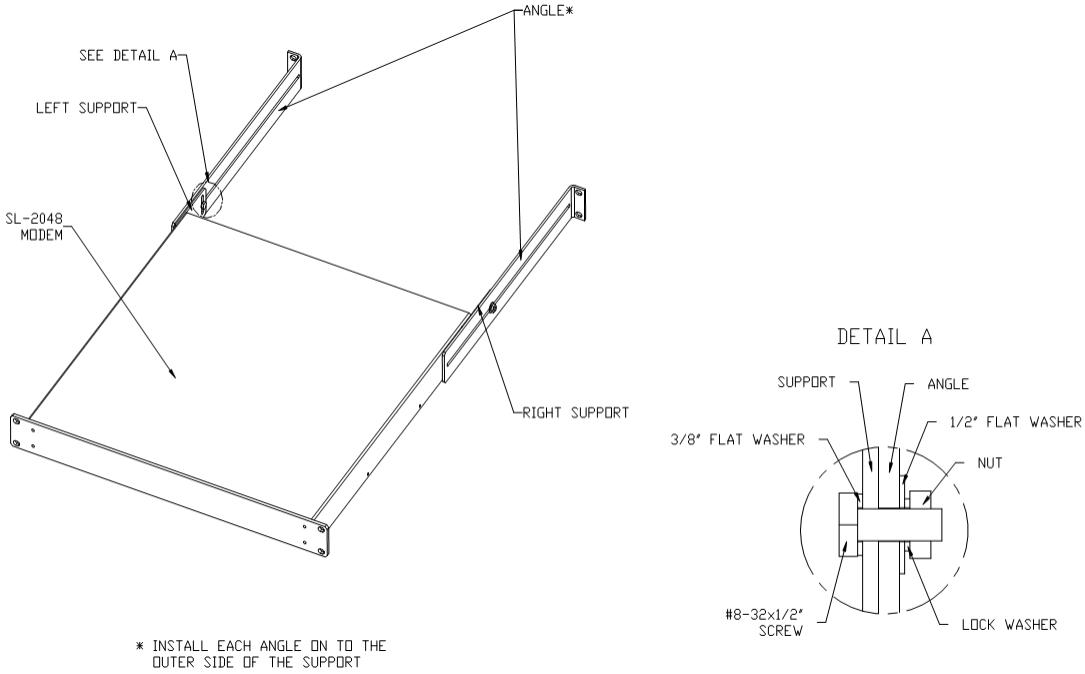


Figure 2.1: Rack Mount Support Kit

The left and right mounting kit supports are attached to the SBM75e Modulator with two #6-32 x 5/16" Phillips countersunk screws. Each angle is attached to a support by one #8-32 x ½" screw, one #8 lock washer, one#8 flat washer 3/8" OD, one #8 flat washer ½" OD and one #8-32 hexagonal nut.

Do not use this product as a support for any other equipment.

2.4.2 Cable Routing

Power supply cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cables at plugs, convenience receptacles, and the point where they exit from the appliance.

Do not run AC power cables in the same duct as signal leads.

2.4.3 Equipment Access

Ensure that the SBM75e Modulator is installed in such a way as to allow access to the rear of the unit and the connectors.

2.4.4 Ventilation

WARNING...

NEVER PUSH OBJECTS OF ANY KIND INTO THIS EQUIPMENT THROUGH OPENINGS AS THEY MAY TOUCH DANGEROUS VOLTAGE POINTS OR SHORT-OUT PARTS THAT COULD RESULT IN A FIRE OR ELECTRIC SHOCK. NEVER SPILL LIQUID OF ANY KIND ON THE PRODUCT.

Cautions

1. **Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a rack unless proper ventilation is provided or the instructions have been adhered to.**

2. **Do not install equipment so that the air intake of one aligns with the outlet on another. Provide baffles and adequate spacing.**
3. **The fans contained within this unit are not fitted with a dust/insect filter. Pay particular attention to the environment in which it is to be used.**

The unit is designed for stationary or fixed use only. Ensure it is firmly and safely located and has an adequate through-flow of air. Allow at least 50 mm free air-space at each side of the equipment. Units in racks can be stacked without ventilation panels between. Racks containing stacked equipment may need to be forced-air cooled to reduce the operating ambient temperature. For stacking constraints contact Advantech Customer Support.

Figure 2.2: Air Path Through the Enclosure

2.5 Power Requirements and Earthing

Caution

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your business, consult a qualified electrical engineer or your local power company.

The SBM75e Modulator is available in an AC powered version which may be operated with any regular worldwide office or domestic supply.

2.5.1 Power Cables

WARNINGS

1. **THIS UNIT MUST BE CORRECTLY EARTHED THROUGH THE MOULDED PLUG SUPPLIED. IF THE LOCAL MAINS SUPPLY DOES NOT HAVE AN EARTH CONDUCTOR DO NOT CONNECT THE UNIT. CONTACT CUSTOMER SUPPORT FOR ADVICE.**
2. **BEFORE CONNECTING THE UNIT TO THE SUPPLY, CHECK THE SUPPLY REQUIREMENTS IN ANNEX B, TECHNICAL SPECIFICATION.**

2.5.2 AC Power

AC power is supplied to the modulator via socket JP1 (IEC 320(M) on the rear panel.

WARNING

UNDER NO CIRCUMSTANCES SHOULD THE EARTHING PIN OF A 3-PIN PLUG BE REMOVED TO OPERATE WITH A 2-PIN SOCKET.

Caution

The SBM75e Series Modulators are shipped with a North American standard 3-pin power cable that is designed to work with 100-120V power supplies only. If you are in a country or territory that does not support this power cable design or voltage supply, please provide your own appropriate 3-pin power cable for powering the unit.

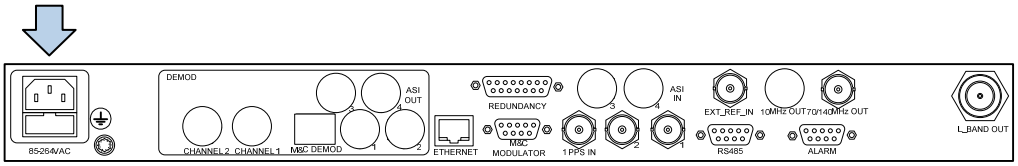


Figure 2.3: Location of AC power connector

For AC units, the modulator requires a supply voltage in the range 96-263 VAC, 47-63 Hz. Modulators without the optional internal Block-Up Converter (BUC) power supply will produce up to 110 W loading on the AC supply. Modulators with internal BUC power supplies can increase this loading to a maximum of 220 W.

2.5.2.1 Connecting the SBM75e Modulator to the AC power Supply

WARNINGS

3. **DO NOT OVERLOAD WALL OUTLETS AND EXTENSION CABLES AS THIS CAN RESULT IN FIRE OR ELECTRIC SHOCK**
4. **AS NO MAINS SWITCH IS FITTED TO THIS UNIT, ENSURE THE LOCAL AC POWER SUPPLY IS SWITCHED OFF BEFORE CONNECTING THE POWER CABLE.**
5. **THIS UNIT IS NOT FITTED WITH AN ON/OFF SWITCH. ENSURE THAT THE SOCKET OUTLET IS INSTALLED NEAR THE EQUIPMENT SO THAT IT IS EASILY ACCESSIBLE. FAILURE TO ISOLATE THE EQUIPMENT CORRECTLY MAY CAUSE A SAFETY HAZARD.**

To connect the unit to the local ac power supply:

1. Ensure the local ac supply is switched OFF.
2. Ensure the correct fuse type and rating has been fitted to both the equipment and the a.c. power cables.
3. Connect the ac power leads to the SBM75e Modulator mains input connector and then to the local mains supply.

2.5.2.2 General

Check that the AC power cable is suitable for the country in which the unit is to be used.

The unit is supplied with a detachable mains-supply cable fitted with a moulded plug suitable for the USA, UK or Europe as appropriate.

The wires in the mains-supply cable are coloured in accordance with the wire colour code shown in *Table 2.2.*

Table 2.2: Supply Cable Wiring Colours

	UK (BS 1363)	EUROPE (CEE 7/7)	USA (NEMA 5-15P)
Earth:	Green-and-yellow	Green-and-yellow	Green
Neutral:	Blue	Blue	White
Live:	Brown	Brown	Black

If the colours do not correspond with the coloured markings identifying the terminals in a locally supplied plug, proceed as in *Table 2.3* (included for reference).

Table 2.3: Non Standard Supply Cord Wire Colours

Wire Colour (UK)	Action
Green-and-yellow	Must be connected to the terminal in the plug which is marked with the letter E or the safety earth symbol ⏚ or coloured green or green-and-yellow.
Blue	Must be connected to the terminal in the plug which is marked with the letter N or coloured black.
Brown	Must be connected to the terminal in the plug which is marked with the letter L or coloured red.

2.5.2.3 Protective Earth/Technical Earth

Connect the SBM75e Modulator technical earth to a suitable point.

WARNINGS

1. **THIS UNIT MUST BE CORRECTLY EARTHED THROUGH THE MOULDED PLUG SUPPLIED. IF THE LOCAL MAINS SUPPLY DOES NOT HAVE AN EARTH CONDUCTOR DO NOT CONNECT THE UNIT. CONTACT CUSTOMER SUPPORT FOR ADVICE.**
2. **BEFORE CONNECTING THE UNIT TO THE SUPPLY, CHECK THE SUPPLY REQUIREMENTS IN ANNEX B, TECHNICAL SPECIFICATION.**

The unit has a Technical earth terminal (marked with ⏚) located adjacent to the rear-panel mains inputs. Its use is recommended. This is **NOT** a Protective earth for electric shock protection. The terminal is provided to:

- Ensure all equipment chassis fixed within a rack are at the same Technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.
- Eliminate the migration of stray charges when connecting between equipment.

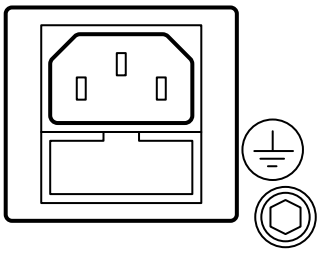


Figure 2.4: Location of Technical Earth

2.6 Signal Connections

The majority of signal connectors are located on the rear panel of the SBM75e Modulator, except for one monitor and control connector located on the front panel.

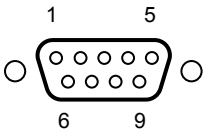
Note

Always use the specified cables supplied for signal integrity and compliance with EMC requirements (*see appendix A, Technical Specification*).

2.6.1 M&C Connector - RS232

A 9-pin D RS-232 connector is located at the top, right of centre, rear panel of the modulator and is provided to support the connection of ANSII 3.64 VT-100 terminals.

Table 2.4: M&C Connector RS232

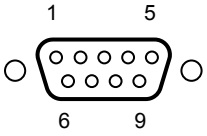
Item	Specification			
Connector type:	9-way, D-type, Female			
Connector designation:	M&C RS232			
Standard:	RS232			
Configuration:	DCE			
Pin-outs:	1	Not Used	6	Not Used
	2	Tx Data	7	Not Used
	3	Rx Data	8	Not Used
	4	Not Used	9	+5 VDC @ 100 mA
	5	Ground		

2.6.2 M&C Connector – RS485

A 9-pin D Dual function RS-485 connector is provided immediately under the RS-232 Monitor and Control connector on the rear panel. This port is configured for 4-wire operation and may be controlled by different protocols, packet protocol mode or BUC control.

Using the RS-485 port with the command or packet protocol allows a number of modulators to be controlled from a client PC. Each modulator being controlled on the same bus must have a unique address.

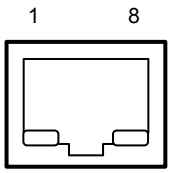
Table 2.5: M&C Connector – RS485

Item	Specification			
Connector type:	9-way, D-type, Female			
Connector designation:	M&C RS485			
Standard:	RS485			
Configuration:	DCE			
Pin-outs:	1	Signal Ground	6	Power Detector +
	2	Power Detector	7	Not Used
	3	Not Used	8	RS-485 Rx+
	4	RS-485 Tx+	9	RS-485 Rx-
	5	RS-485 Tx-		

2.6.3 M&C Connector - 10/100BaseT Ethernet

There are two 10/100BaseT Ethernet M&C ports on the rear panel. One is labeled ETHERNET, and the other is labelled M&C DEMOD (both are RJ-45 connectors; see *Table 2.7* for pin-outs). The M&C DEMOD connector is used during manufacturing and upgrades, and relates to the demodulator (if fitted) only, and should not be used in the field. The ETHERNET connector provides Ethernet capabilities for all functions of the modulator, including the modulator, demodulator, and interface cards (if fitted).

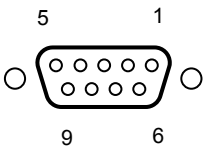
Table 2.6: M&C Connector - 10/100BaseT Ethernet

Item	Specification		
Connector type:	RJ-45 socket		
Connector designation:	ETHERNET		
Standard:	10/100BaseT		
Configuration:	-		
Pin-outs:			
RJ-45 Pin Number	Description	Wire Color Codes	Crossover Cable Pins
1	TX +	White W/Orange	3
2	TX -	Orange	6
3	RX +	White W/Green	1
4		Blue	
5		White W/Blue	
6	RX -	Green	2
7		White W/Brown	
8		Brown	

2.6.4 Monitor and Control Alarms

The connector labelled P5, a 15-pin D-sub (F) provides Form C relay outputs of the modulator's status. Refer to *Table 2.8* for pin-outs and signal description.

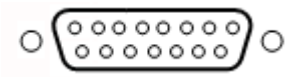
Table 2.7: Alarm Connector Pin-outs

Item	Specification	
Connector type:	9-way, D-sub type, Female	
Connector designation:	ALARMS	
Standard:	Custom	
Configuration:	-	
Relay 1: Not Ued	1	Common
	6	Normally Open
	8	Normally Closed
Relay 2: Modulator	2	Common
	7	Normally Open
	3	Normally Closed
Relay 3: Not Used	5	Common
	4	Normally open
	9	Normally closed

2.6.5 Redundancy

This is an optional feature, although the connector appears on the rear panel (REDUNDANCY, a 15-pin D-sub female). A redundancy kit can be purchased from Advantech AMT to allow two modulators to be connected in a 1:1 redundancy configuration.

Table 2.8: Redundancy Connector Pin-outs

Item	Specification		
Connector type:	9-way, D-sub type, Female		
Connector designation:	ALARMS		
Standard:	Custom		
Configuration:	-		
DB15 (A)	DB15 (B)	RF SWITCH	Note
1	**2**	**AV1**	**RF SW Drive, unit A**
2	**1**	**AV2**	**RF SW Drive, unit B**
3	**3**	**COM**	**Signal Ground**
6	**14**	**--**	**Future Use**
7	**13**	**--**	**Future Use**
8	**15**	**--**	**B --> A Redundancy**
9	**9**	**+C**	**RF SW +12V**
11	**12**	**1**	**RF Relay O/P NC**
12	**11**	**2**	**RF Relay O/P NO**
13	**7**	**--**	**Future Use**
14	**6**	**--**	**Future Use**
15	**8**	**--**	**A --> B Redundancy**

2.6.6 RF (L-Band) Output Connector

The connector labelled as L-Band OUT transmits RF signals to the antenna. For signal specification, see *Appendix A: Technical Specification*.

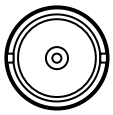
Table 2.9: RF (L-Band) Output Connector

Item	Specification			
Connector type:	F-type 50 Ω female socket			
Connector designation:	L-BAND OUTPUT			
Pin-outs:	Centre	RF Signal		
	Shield	Ground/Chassis		

2.6.7 ASI Input Connector

One or more ASI inputs may be provided on the rear panel, labelled as ASI 1, ASI 2, etc., to receive transport streams. For signal specification, see *Appendix A: Technical Specification*.

Table 2.10: ASI Input Connector

Item	Specification			
Connector type:	BNC 50 Ω socket			
Connector designation:	ASI IN 1 ASI IN 2 ASI IN 3 ASI IN 4			
Pin-outs:	Centre	Video Signal		
	Shield	Ground/Chassis		

2.6.8 1Pulse Per Second (1PPS) InputConnector

One connector is provided to receive a 1PPS signal reference. For signal specification, see *Appendix A: Technical Specification*.

Table 2.11: 1PPS Input Connector

Item	Specification			
Connector type:	BNC 50 Ω socket			
Connector designation:	1PPS IN			
Pin-outs:	Centre	Video Signal		
	Shield	Ground/Chassis		

2.6.9 External Reference Input Connector

One connector is provided to receive an external reference signal. For signal specification, see *Appendix A: Technical Specification*.

Table 2.12: Ext Ref In Connector

Item	Specification			
Connector type:	BNC 50 Ω socket			
Connector designation:	EXT_REF_IN			
Pin-outs:	Centre	Video Signal		
	Shield	Ground/Chassis		

2.6.10 70/140 MHz (IF) Output Connector

One IF output connector provides an IF output. For signal specification, see *Appendix A: Technical Specification*.

Table 2.13: 70/140 MHz (IF) Output Connector

Item	Specification			
Connector type:	BNC 50 Ω socket			
Connector designation:	70/140 MHz OUT			
Pin-outs:	Centre	Video Signal		
	Shield	Ground/Chassis		

2.7 Configuring the Modulator for Best Performance

2.7.1 Bringing the Modulator Online

When bringing a transmit carrier on line, the following sequence must be followed:

1. Power on the modulator for five minutes to allow the oscillator to stabilize.
2. Before connecting the L-band cable to the BUC, verify that:
   - The Symbol rate and the frequency of the modulator are correctly set

- BUC power is off (*bucpower* off)
- 10 MHz reference is off (*tfref* off)

3. Set modulator power to -25 dBm (*tlevel* -25)
4. If required and if the option is fitted, turn on DC power to BUC (*bucpower* on).
5. If required and if the option is fitted, turn on 10 MHz reference to the BUC *(tfref* on).
6. Increase modulator output power to desired level (*tlevel* < desired level >).

Note

Before attempting to bring the modulator on line, the operator should become familiar with the operation of the modulator while off line. Refer to the manual to obtain a thorough understanding of modulator operation using a terminal emulator (or PC with terminal emulation program).

2.7.2 Choice of FEC

The SBM75e modulator will always support a traditional basic DVB-S (RSV) coding scheme with BPSK and QPSK modulation – either Intelsat IESS-308/9, or DVB-S (or both). Traditionally Intelsat systems have been used for telecommunications data (multiple 64kbps streams and T1/E1 traffic) while DVB-S has been used for MPEG digital video broadcasting. However, DVB systems are increasingly also being used to transmit data both in MPEG format and as raw data.

DVB FEC systems always concatenate RS and Viterbi coding whereas the Intelsat systems support RS as an option. Operation without RS can be important when transmitting low-latency services such as voice traffic: removing the RS decoding overhead.

With BPSK and QPSK modulation, DVB-S supports ½, 2/3, ¾, 5/6 and 7/8 inner code rates with a RS (204,188) outer code. Intelsat supports ½, ¾ and 7/8 inner code rates with various outer RS code rates including RS (126,112) and RS (219,201). The Intelsat system without RS codes offers a few 100 data bits of latency. With RS coding, an interleaver of depth 4 or 8 can be chosen to trade off latency and performance. The DVB system has approximately 32kbits of latency (code-rate dependent).

The modulator can transmit RS-530 or HSSI data using either DVB-S or Intelsat. DVB systems out-perform (by approximately 1dB) Intelsat systems because they include a better interleaver between the constituent Viterbi and RS codes.

The SBM75e modulator also supports higher order modulation systems, such as 8PSK and 16QAM. These systems are typically used when the link budget permits since, in combination with appropriate FEC, they permit higher spectral efficiency and hence reduce the required satellite bandwidth.

8PSK modulation is currently more popular than 16QAM as it does not require high-linearity amplifiers and transponders. The AMT-70 modulator can be enabled to support IESS-310 8PSK systems (a PTCM 2/3 code, with an RS (219,201) outer code) giving about 2 bits/s/Hz. It can also support DVB-DSNG (PTCM 2/3, 5/6 and 8/9 rates, with the RS (204,188) code) and eTPC rates 0.75,0.79, 0.87 and 0.92. Turbo modes are about 1dB better than the roughly equivalent DVB-DSNG systems. The Intelsat system is about 1.5dB inferior to the DVB system, due to differences in the interleaving structure.

The SBM75e modulator also supports 16QAM in two coding modes: DVB-DSNG and eTPC. DVB-DSNG 16QAM supports ¾ and 7/8 rates with the RS (204,188) outer code. 16QAM with eTPC can usefully operate in 4 rates: 0.75, 0.78, 0.87 and 0.92.

Note

The DVB system can be configured to transmit both MPEG-2 and non MPEG-2 data. When using DVB modes to transmit non MPEG-2 data it is necessary to turn DVB REMOVE MARK ON in the modulator (command *RRMVMK* ON). This is required, since DVB FEC utilizes the MPEG framing structure, which must therefore be imposed by the modulator (and similarly removed by the modulator). There is a performance overhead associated with the sync byte, but it is only 0.5% of data rate.

Table 2.14: FEC/Mode/Rate Configuration Values

Mode	Modulation	Rates
Intelsat 308/309	BPSK, QPSK OQPSK	Rates: ½, ¾ and 7/8 are valid along with the option of Reed-Solomon OFF/ 219 or 126
Intelsat 310	8PSK	Rates: 2/3 and again with the option of Reed-Solomon OFF/ 219 or 126
DVB-S	QPSK OQPSK	Rates: ½, 2/3, ¾, 5/6 and 7/8
DVB-DSNG	8PSK and 16QAM	Rates 2/3, 5/6 8/9 in 8PSK and ¾ and 7/8 in 16QAM.
DVB-S2S	QPSK, 8PSK, 16APSK, 32APSK	Rates ¼, 1/2. 3/5 2/3, ¾, 4/5, 5/6, 8/9
DVB-S2N	QPSK, 8PSK, 16APSK, 32APSK	Rates 1/2. 3/5 2/3, ¾, 4/5, 5/6, 8/9, 9/10, 1/4
TPC4K	BPSK,QPSK, oQPSK, 8PSK and 16QAM	Rate 4/5 and 3/4
TPC16K	BPSK,QPSK, oQPSK, 8PSK and 16QAM	Rate 2/5, 3/5, 8/9, 7/8 and 19/20.
OM73	BPSK, oQPSK and QPSK and NONE	NONE, 1/2 and 3/4

2.7.3 Pilots Insertion

To aid carrier recovery and a physical layer framing synchronization, the DVB-S2 standards proposes optional insertion of pilot symbols. The system provides a regular physical layer framing structure, based on SLOTs of M = 90 modulated symbols, allowing reliable receiver synchronization on the FEC block structure. A slot is devoted to physical layer signalling, including Start-of-Frame delimitation and transmission mode definition. This mechanism is suitable also for VCM and ACM demodulator setting. Carrier recovery in the receivers may be facilitated by the introduction of a regular raster of pilot symbols (P = 36 pilot symbols every 16 SLOTs of 90 symbols), while a pilot-less transmission mode is also available, offering an additional 2,4 % useful capacity. The pilot presence/absence in VCM and ACM can be changed on a frame-by-frame basis.

With the receiver algorithms taken into consideration, carrier synchronization can be achieved in presence of phase noise of existing outdoor equipment, including the LNB and worst-case thermal noise for any DVB-S2 mode. Some of the transmission modes, such as for example 8PSK rate 3/5 and rate 2/3, 16APSK rate 3/4 and 32APSK 4/5 required the use of pilot symbols to avoid cycle slips. For ACM operation, the use of pilot symbols can guarantee continuous receiver synchronization.

CHAPTER 3: Front Panel Monitoring & Control

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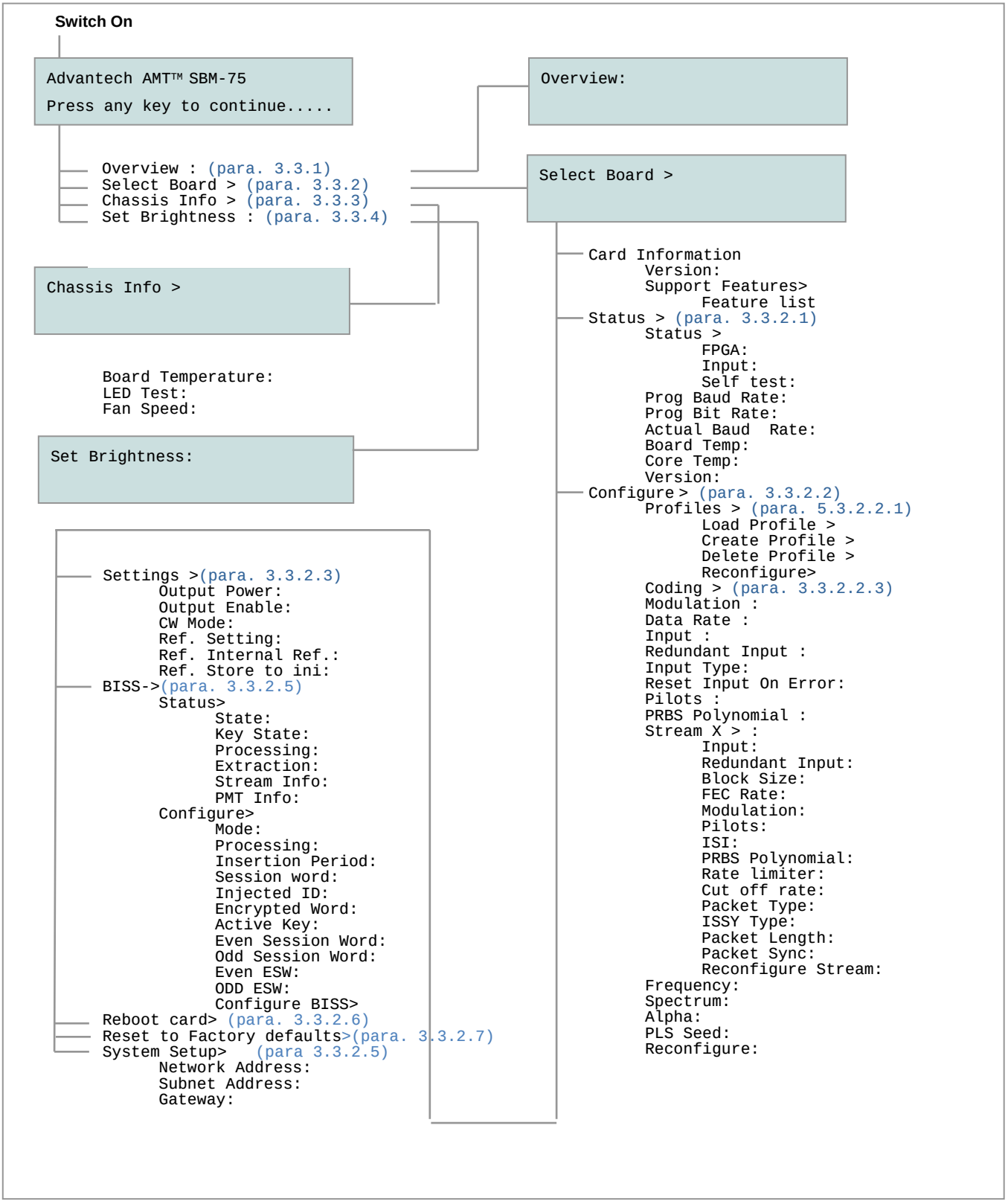
3.1 Introduction

The SBM75e Modulator is equipped with an active front panel (LCD screen and keypad) which provides an easy way to setup the Modulator without the need for a PC or generic control system. This chapter is intended to allow maintenance personnel or users to quickly set up the Modulator for initial use.



3.2 Powering up the Modulator

When power is applied to the Modulator (in accordance with the instructions given in *Chapter 2, Installation*), approximately 90 seconds should be allowed for the system to boot-up, complete internal checks, allow the internal crystal oven to reach operating temperature and the frequency of the crystal to stabilize. The following screen is then displayed:

```
Advantech AMT™ SBM-75
Press any key to continue.....
```

3.3 Basic Front Panel Operation

When the Modulator has completed the boot-up process, pressing any key will cause the top level menu to be displayed. The options available from this menu are shown in *Table 3.1*.

Note

When a key is pressed following start-up, the start-up screen will not be displayed again unless the unit undergoes a power cycle.

Table 3.1:Top Level Menu

Menu Item	Operations
`Overview :`	This is a monitor function which reports the overall status of the unit. This will report unlocked if any of the cards within the chassis is unlocked.
`Select Board >`	This will list all available cards with the user specified names. From this menu these units can be monitored and controlled. At present each card has an individual network address which is set within this menu.
`Chassis Info >`	General Chassis information which is not specific to a card is displayed here such as Fan speeds etc. Also tests such as LED tests are set within this menu.
`Set Brightness:`	Allows the user to adjust the brightness of the display.

3.3.1 Overview

This option reports an overall summary of the system. At present, if any card is unlocked then it will report as unlocked.

3.3.2 Select Board

The chassis has been designed to be highly configurable and can be used with a range of Modulators and miscellaneous interface cards. These cards can have user specified names which are set within the GUI. The Select Board functions may be viewed by clicking on the Select Board option from the Overview screen. The options available from this menu are detailed in *Table 3.2.*

Table 3.2: Select Board Menu

Menu Item	Operations
Card Information >	Reports card information such as feature keys and software version
Status >	Lists the status of the input and configuration. All parameters in this menu are read only.
Configure >	Allows configuration of various parameters within the unit.
Settings >	All the instantaneous commands such as power level and output enable are controlled here
BISS >	BISS controls and status displayed if enabled
Reboot Card >	Will prompt a question to reboot the card
Reset To Factory Defaults >	Will prompt a question to reset the unit to the factory defaults
System Setup >	Allows configuration of card Ethernet address.

3.3.2.1 Card Information

The Software version of the card is displayed as well as all supported feature keys.

3.3.2.2 Status

Table 3.3: Status Menu

Menu Item	Operations	
FPGA :	The FPGA has been programmed and is functioning correctly. If it fails this suggests a hardware fault or faulty upgrade. Read only.	
Input:	The status of the input. If unlocked then this suggests the input bit rate is not as expected. Read only.	
Self Test :	The report of the self test which was run at start up, if this fails then please report this to Advantech support.	
Output Power :	If this does not report calibrated then please report this to Advantech support	
Prog Baud Rate:	The programmed Baud rate in Sym/S. Read Only.	
Prog Bit Rate:	The programmed bit rate in b/s. Read Only.	
Actual Baud Rate:	The Actual Baud rate which is required to match the incoming bit rate. Read Only.	
Board Temp:	The Temperature of the board in Celsius. Read Only.	
Core1 Temp:	The FPGA Core temperature in Celsius. Read Only.	
Achieved Power :	The actual power level transmitted which should match the required power level when operating within the calibrated range.	
Ref. Setting :	Reports if the frequency is locked to an internal source or external	
Re. Clock :	Reports the status of the reference source if it is locked.	
Ref. Signal :	Reports if a signal is present at the reference source	
CCM State >	Sub directory listing the status of CCM settings	
	Input Type ;	Off: not used; Main: Main input used; Spare: Redundant input used.
	Overflow :	This will report OK or FIFO FULL
	Sync :	This will report the input is synchronised
	Rate Measure :	This will report the incoming bit rate in Kbit/s
STREAM x State	Sub directory listing the status of the settings for Stream X, this is only applicable if ACM has been configured.	
	Input Type ;	Off: not used; Main: Main input used; Spare: Redundant input used.

Menu Item	Operations	
	Overflow :	This will report OK or FIFO FULL
	Sync :	This will report the input is synchronised
	Rate Measure :	This will report the incoming bit rate in Kbit/s
	Rate Limit :	This will report on the status of the rate limiter which will state either “Not Enabled”, “Rate Exceeded” or OK

3.3.2.3 Configure

All options selected within this menu are pending settings and will not take effect until the unit is reconfigured. The settings are only saved when the unit is reconfigured and will be lost if the user exits out of the configure menu or the unit is power cycled.

The options in this Menu will vary and depend upon the chosen coding scheme; this is stated in the list below. It is recommended that the entry be done from top to bottom ensuring that only applicable menus will be displayed. The Configure sub-menu may be viewed by selecting the Configure option from the Select Board menu. The available options are detailed in *Table 3.6.*

Table 3.4: Configure Sub-menu

Menu Item	Operations
`Profiles >`	Different operational profiles can be saved and loaded via this submenu.
`Coding:`	The coding scheme is chosen from a list which is dependant upon the feature keys that are installed.

3.3.2.3.1 Profiles

The user can store and recall configurations with clear user definable names. The stored file is shared by all user interfaces so the GUI could be used to clone a configuration to several units and the front panel could be used to retrieve this setting. The Profiles sub-menu allows the user to access these configurations.

Note

The front panel is slightly more restrictive than the GUI due to a limited display and the key entry system but is still easy to use.

To load, delete or create profiles:

1. Select the Profiles option from the Configure sub-menu. The options displayed are detailed in *Table 3.7.*

Table 3.5: Profiles Sub-menu

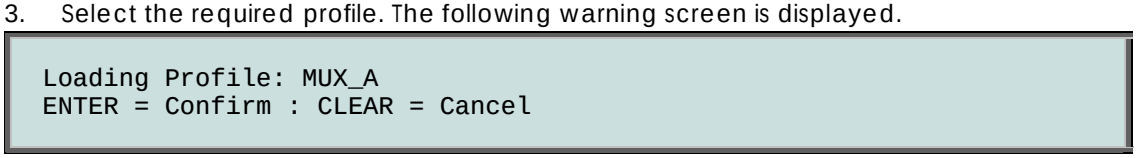
Menu Item	Operations
`Load Profile >`	This option will only be displayed if there are stored profiles.
`Create Profile >`	This submenu will allow a name to be created and the configuration to be stored to non-volatile memory on the card.
`Delete Profile >`	This submenu is only displayed if profiles have been stored. It will allow unwanted profiles to be deleted. A profile should first be loaded then it can be deleted from the memory on the card.
`Reconfigure >`	Allows the profiles to be configured

2. Select the Load Profile option. The following screen is displayed.

Note

The down arrow indicates that there are more profiles available. 10 profiles are currently supported.

3. Select the required profile. The following warning screen is displayed.



The new configuration will be pending until the unit is reconfigured.

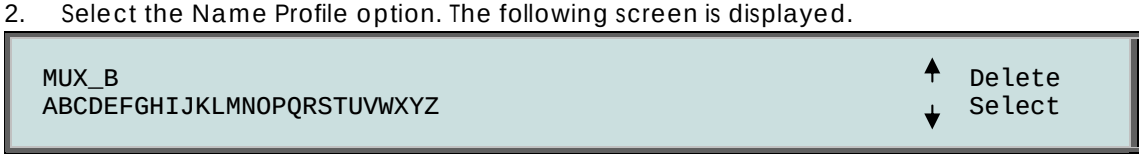
To create and save a new profile:

1. Select the Create Profile option from the Profiles sub-menu. The following screen is displayed.

Note

Until a profile has been named, it cannot be saved and will not appear on the menu.

2. Select the Name Profile option. The following screen is displayed.



3. Use the left and right arrows to navigate to the character required or use the numeric pad 0-9 to enter numbers.
4. Press the down arrow to select the character and the up arrow to delete.
5. When the name entry is complete, press the ENTER key.

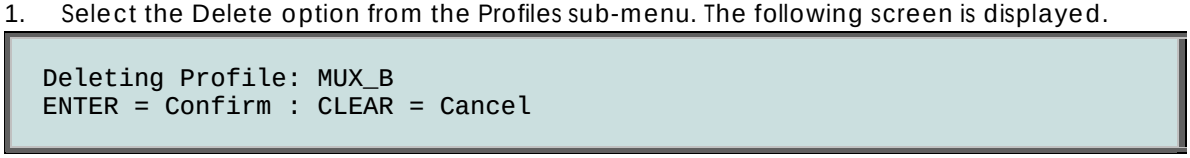
Note

A total of 30 upper case characters can be entered on the front panel display. When using the GUI, up to 64 upper and lower case characters may be entered.

6. Select the Save option. The following screen is displayed.

To delete a profile:

1. Select the Delete option from the Profiles sub-menu. The following screen is displayed.



3.3.2.3.2 Coding

When Coding is selected then the coding type is highlighted. By using the up and down arrows this coding type can be altered. The options are dependant upon the feature keys installed but the possible list is detailed in *Table 3.9.*

Table 3.6: Coding Types.

Coding Type	Remarks	Supported Code rates
DVBS	DVB-S	½, 2/3, ¾, 5/6, 7/8
DSNG	DVB-DSNG	2/3, ¾, 5/6, 7/8, 8/9
DVBS2S	DVB-S2, Short Frames (16K)	¼, 1/3, 2/5, ½, 3/5, 2/3, ¾, 4/5, 5/6, 8/9, ACM
DVBS2N	DVB-S2, Normal Frames (64K)	¼, 1/3, 2/5, ½, 3/5, 2/3, ¾, 4/5, 5/6, 8/9, 9/10, ACM

To view and alter the coding type:

1. Select Coding from the Configure sub-menu. One of the following screens is displayed:

```
→ Coding: [DVBS2N 9/10]
```

```
→ Coding: [DVBS2N 9/10]
```

2. Using the right arrow highlight the required code rate.
3. Using the up and down arrows, select the required code rate.
4. Press ENTER. A list of options, detailed in *Table 3.10* is displayed.

Note

When selecting a code rate, note that only legal values are selectable. ACM is a special case for DVB-S2.

Table 3.7: Coding Options

Menu Item	Operations
`Modulation :`	This option does not appear if ACM has been selected. Only the possible combinations for the chosen code type and rate will appear. This may also be limited by the feature keys installed. The possible range is BPSK, QPSK, 8PSK, 16QAM, 16APSK and 32APSK.
`Data Rate :`	This sets either the data rate in bits per second or symbol rate in symbols per second. The data rate can either be set by the numerical value or by the up/down arrows. Once the value is set then the units can be changed from BPS to SPS by moving the cursor to the end and then using the up/down arrows. For ACM the value must be set as SPS. `-> Data Rate: [199000000 BPS]`

Menu Item	Operations	
Input :	This entry does not appear in ACM mode. This allows the selection of the source of the input. The options are OFF, ASI1, ASI2, ASI3, ASI4, PRBS. The number of ASI is dependant upon unit configuration.	
Redundant Input :	This entry does not appear in ACM mode. This allows the selection of the source of the input. The options are OFF, ASI1, ASI2, ASI3, ASI4, PRBS. The number of ASI is dependant upon unit configuration.	
Input Type :	This is the method of locking to the incoming data.	
	VBR	Variable bit rate mode will add Mpeg Null packets to guarantee a fixed symbol rate. The data rate has to be set to SPS, not BPS. The PCR values are re-stamped to meet the PCR jitter requirements. The reset on error tick box is only valid in this mode. If this box is ticked and the input is removed then the output will be disabled - otherwise null packets are transmitted continuously. 204 byte Mpeg packets are automatically accepted and converted to 188 byte packets, the bit rate assumes the transmission of 188 byte packets.
	Normal	The transmitted carrier is frequency locked to the input data rate. The data rate can be set as BPS or SPS and the calculation is performed. This operation acts as a seed and the actual symbol rate is reported in the status window. The data stream is not modified. In DVB-S2 the data will be transmitted as Transport streams and sync detection is performed. The VBR on Error tick box will only appear in this mode, when the input is removed and the box ticked then Null packets will be transmitted until the signal is replaced. 204 byte Mpeg packets are automatically accepted and converted to 188 byte packets, the bit rate assumes the transmission of 188 byte packets.
	Unframmed	In DVB-S mode the data is required to be in a MPEG transport stream format i.e. a 0x47 Sync mark every 188 bytes. In Unframed mode a sync mark is inserted which needs to

Menu Item	Operations	
		be removed within the demodulator. In DVB-S2 the data is transmitted without modification and no sync detection is performed. The data will be transmitted as Generic Stream Continuous.
Reset Input on Error :	This is only valid when the input type is selected to VBR, when ON then the unit will reset when the input is removed otherwise it will transmit null packets until the input returns.	
VBR on Error :	This is only valid when the input type is set to Normal. When the input is removed then null packets will be transmitted until the input returns.	
Pilots:	This entry will only appear when DVBS2S or DVBS2N is selected and not ACM. This enables or disables pilot insertion.	
PRBS Polynomial :	This option is only available if the input has been selected to be PRBS. This is the pseudo Random sequence which conforms to the DVB guidelines. The options are: $1+X^{18}+X^{23}$, $1+X^{17}+X^{20}$, $1+X^{14}+X^{17}$, $1+X^{14}+X^{15}$, $1+X^{5}+X^{6}$ or the inverted version of these.	
Stream X >	A submenu that only appears for ACM. It is used to configure Stream X, there is a submenu per stream.	
Frequency:	The carrier frequency can be set from 950Mhz to 2150Mhz.	
Spectrum:	The Spectrum can be selected as Normal or Inverted.	
Alpha:	The roll off factor can be selected from 0.12 to 0.35, this is set using the up/down arrows.	
PLS Seed:	Physical Layer Scrambling Seed is only available in DVB-S2 modes. This should be used with caution and the default value is 0. The range for this value is 0 to 262141 and the value is entered in decimal. The demodulator will have to use the same seed value to lock otherwise the transmitted modulation and code rate will not be decoded.	
Reconfigure:	This button will activate all the pending options described above.	

When all of the options in *Table 3.10* have been set:

1. Select Reconfigure. The following screen is displayed:

```
Reconfigure?
ENTER = Confirm : CLEAR = cancel
```

2. Select ENTER. The unit is reconfigured with the pending settings; this will cause a break in the reception. All the pending settings are then stored and will be reused if a power cycle occurs. If the unit was not reconfigured then the pending settings are discarded if the unit is power cycled or the user exits out of the CONFIGURE menu.

Stream X

This mode is only available when ACM in DVB-S2 is selected. Currently three streams are supported but more will be added in the future. All streams have the same menu structure but are independent. All changes within this menu will remain pending if exited up to the configure menu but they will be lost if exited out of the configure menu.

The Stream X options may be viewed by selecting Stream X from the coding sub-menu. A list of options, detailed in *Table 3.11* is displayed.

Table 3.8: Stream X Sub-menu

Menu Item	Operations
Input:	The selection can be off, PRBS, ASI X for stream X, ASI 1, ASI X L2 and ASI 1 L2. Setting Off will prevent any transmission of that stream. Setting PRBS will output a random stream and the rate will be set by cut off rate if the rate limit is set otherwise the PRBS will fill all available bandwidth.
Redundant Input:	The input is selected from off or ASI N where N is the redundant ASI pair e.g. for stream 1 the redundant input would be ASI 2. If the main input is removed then the unit will switch to the redundant input, which will cause an alarm to be raised. When the main input is restored the unit will continue to use the redundant input until this stream is reconfigured.
Block Size:	In theory each stream can independently be controlled to use either a short (16K) block size or Normal (64K) but in reality most receivers will only be able to handle a constant block size. The options are Short or Normal.
FEC Rate:	All the DVB-S2 rates are available
Modulation	The Available options are QPSK, 8PSK, 16APSK and 32APSK
Pilots:	Pilots can be enabled on a per stream basis but it is highly recommended to use Pilots in ACM and VCM.
ISI:	This is the Input Stream Identifier. Each Stream should have a unique value from 0 to 255. If two streams have the same ISI value then it will be impossible to decode both streams.
PRBS Polynomial:	This option is only available if the input of the stream has been selected to be PRBS. This is the pseudo Random sequence which conforms to the DVB guidelines. The options are: $1+X^{18}+X^{23}$, $1+X^{17}+X^{20}$, $1+X^{14}+X^{17}$, $1+X^{14}+X^{15}$, $1+X^{5}+X^{6}$ or the inverted version of these.
Rate Limiter	When this is selected the data rate will be limited to the rate set in the cut off rate text entry box. This is intended to limit a stream to a set bit rate and prevent it stealing bandwidth from a fellow stream. This is also used to set the bit rate for the PRBS sequence.
Cut off rate:	This is only available if the rate limiter has been selected. This will set the maximum rate and input will be allowed before data is discarded. The value is set in bits per second. This also sets the rate of the PRBS sequence.
Packet Type:	Packet type can either be TS (transport Streams), GSC (Generic Stream Continuous), GSP (Generic Stream Packetized). TS mode will expect packets which are 188 bytes long with a 0x47 Sync mark. GSC will have no framing structure. GSP will have a programmable structure set by the packet length and the packet Sync.
ISSY Type:	This is for Input Stream Synchronisation which is used in DVB-S2 ACM and VCM to give a constant latency. This is only applicable for Transport Streams. The options are off, short or long. Short will add 2 bytes per packet and long will add 3 bytes.
Packet Length:	The Packet length is only applicable if the packet type is GSP. This length is in bytes. A value of 0 means there is no structure.
Packet Sync:	This is the expected Sync mark expected in the incoming data stream with a frequency set by the packet length. This is only applicable if the packet type is set to GSP. If this Sync mark is set to 0 then this is a special case where no sync is expected but a CRC byte is inserted with a frequency set by packet length. This is then removed by the receiver and this will produce a PER (Packet Error Rate).

3.3.2.4 Settings

This option allows setting of output parameters. These parameters may be viewed by selecting the Output option from the Select Board sub-menu. The parameters available are displayed in the following *Table 3.12*.

Table 3.9: Output Sub-menu

Menu Item	Operations
`Output power:`	Set the output power in dBm.
`Output Enable:`	Enable the output, this is selectable between ON and OFF
`CW Mode:`	To enable Continuous Wave Test Mode set to ON
`Ref. Setting:`	A highly accurate internal clock source can be used by selecting Internal or an External 10 MHz reference can be used by selecting External. If an external reference is used then this frequency can be held by selecting hold, this would then allow the external reference to be removed.
`Ref. Internal Ref.:`	The Internal timing can either be free running or aligned to a stored frequency which was derived from an external reference and then stored via the store frequency button.
`Ref. Store to ini:`	This stores the frequency of the reference for future use.

3.3.2.5 BISS

This heading contains all the information to configure and monitor the BISS encryption.

3.3.2.5.1 Status

Table 3.10: BISS status values

Property	Status	Description
State	Uninitialized	Error condition, BISS failure
	Idle : illegal in this mode	BISS cannot be used in this mode
	Idle	BISS is turned off
	Configured	BISS is active, this will include BISS-0 Mode
Extraction	Active	SI extraction is active
	Inactive	no SI extraction
Keys	OK	Valid keys present, this should always be OK
stream info	PAT not found	The PAT is not detected, critical failure
	Corrupted tables	At least one of the PMT listed in the PAT cannot be extracted or At least one of the PMT has a bad structure or a CRC error
	No CAT detected	CAT is not found, this can be normal
	OK	Transport stream is OK
processing	Ciphering	The block cipher is engaged and ciphering
	Unciphering	The block cipher is engaged and deciphering

Property	Status	Description
	None	The block cipher is not engaged
PMT info	Too many PMT(s)	too many PMT(s) are received for the playout RAM (overflow)
	Incorrect PMT(s)	A PMT cannot be modified to add/remove BISS SI (PIDs listed in the PMT would not be ciphered/deciphered)
	Missing PMT(s)	A PMT listed in the PAT could not be retrieved
	OK	All is OK

3.3.2.5.2 Configure

3.3.2.5.3 BISS Mode Selection

The options for the BISS mode are Off, Mode-0, Mode-1, Mode-E, Odd/Even-1, Odd/Even-E, User-1 and User-E. Depending upon the selection, the available options will change

Note

All session words, injected ID and Encrypted session words cannot be read back and are not echoed back to the display. These values are also not stored in the profiles but will be reused after a power cycle. To comply with the specification the keys cannot be changed more than ten times in a 5-minute period and that there is a minimum of 10 seconds between changes. The keys are transmitted in the clear via the GUI so should be used with caution, perhaps by setting the Injected ID up only on the front panel and never via the GUI.

3.3.2.5.4 Off

BISS is fully disabled and the transport stream will be unmodified. If BISS is subsequently enabled then the modification in the transport stream may cause a momentary glitch in the video. It is preferable to use BISS-0 which will modify the transport stream without encrypting the video.

3.3.2.5.5 BISS-0

The transport stream will not encrypt in this mode but is modified to add signalling about BISS. In this mode encryption can be enabled seamlessly.

3.3.2.5.6 BISS-1

The transport stream is encrypted using the session word which is a 12 digit hex value. If the key is not present then the last entered value will be used. This session word is independent from the key generated when using BISS-E and will be retained.

3.3.2.5.7 BISS-E

The transport stream is encrypted by a calculated session word. This session word is generated from an injected ID and an Encrypted session word. This is fundamentally more secure as both the Injected ID and Encrypted session words are required for decryption and each receiver could have a unique Encrypted session word. The Injected ID is a 14 digit Hex value and the Encrypted Session Word (ESW) is a 16 digit hex value. If the key or the ID is not present then the last entered values will be used.

3.3.2.5.8 Odd/Even-1

This mode is not part of the BISS standard but has been successfully interoperated with other manufacturers who have similar variants. Each MPEG packet has a field in the header which indicates if it is in the clear, encrypted using an ODD key or encrypted using an even key. While BISS only uses the one key, this mode allows two independent keys. The advantage of this mode is that it allows keys to be programmed offline while using the other key for decryption. Both the odd and the even session word will require a 12 digit hex value. The even key is the same key as that used for BISS-1.

3.3.2.5.9 Odd/Even-E

Odd/Even-E also uses the odd and even keys in the same way as Odd/Even-1 mode but each key is encrypted using the same Injected Id. The Injected Id will require a 14 digit hex value and the ESWs will both require 16 digit hex values. The even key is the same key as used for BISS-E.

3.3.2.5.10 User-1

This enables a specific user mode where specific PIDs are decrypted. The SI information is not altered so this mode is not BISS compliant. The actual PIDs to be decrypted are specified only on the command line. A 12 digit hex value is required for the session word. The even key is the same key as used for BISS-1.

This mode is used to guarantee that the decrypted transport stream will match the original.

3.3.2.5.11 User-E

This is identical to the User-1 mode except a 16 digit hex value is required for the ESW and a 14 digit hex value is required for the injected ID. The even key is the same key as used for BISS-E.

3.3.2.5.12 Processing

This will be set for Encode for encryption and decode for decryption. This setting will depend upon supported feature keys.

3.3.2.5.13 BISS Insertion Period

This sets the frequency that the Program Association Table (PAT), Programme Map Table (PMT) and Conditional Access Table (CAT) will be inserted into the stream. The default is 200 ms and this value should be suitable in most circumstances.

3.3.2.5.14 BISS Active Key

When the BISS Mode is either Mode-E or ODD/EVEN-E or User-E then the BISS Active Key can be selected. This determines which key shall be used.

3.3.2.5.15 Entering keys and ID's

The Keys are entered using a hexadecimal notation. Use the left and right arrows to select the required character then use the down arrow to select the character. This can be deleted using the up arrow. When the Key or Id is complete then press ENTER.

3.3.2.5.16 Configure BISS

Use this configure to activate all the BIS settings. All settings will be stored and reused after a power-cycle. These values will not be stored in the profiles as keys can not be stored, they must be manually re-entered.

3.3.2.6 Reboot card

The card is rebooted. This will be required after a software upgrade and will not effect other cards within the chassis.

3.3.2.7 Reset to factory defaults

The card is reset to the factory default mode

3.3.2.8 System Setup

The card Ethernet address can be configured from this menu. The current settings may be viewed by selecting the System Setup option from the Select Board Menu. The following screen is displayed:

```
Network Address: [010.000.014.017]
Subnet Mask    : 255.255.000.000
Gateway        : 000.000.000.000
```

3.3.3 Chassis Info

This option allows the viewing of various board parameters by selecting the Chassis Info option from the Top Level menu. The Parameters are displayed in the following *Table 3.13.*

Table 3.11: Chassis Info Sub-menu

Menu Item	Operations
Board Temperature:	Reports the overall temperature of the chassis as opposed to specific cards.
LED test:	The front panel LED will flash in turn.
Fan Speed	This will report the speed of up to 4 Fans. Note not all fans are fitted as this is a manufacturing option dependent upon the system configuration.

If the Fan Speed option is selected, the following screen is displayed showing the speeds of all fans fitted within the unit.

```
Fan  1  Speed:  0   rpm
Fan  2  Speed:  0   rpm
Fan  3  Speed:  0   rpm
Fan  4  Speed:  0   rpm
```

CHAPTER 4: Web GUI Monitoring & Control

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4.1 Introduction

This chapter is provided to guide the user through the functions of the Graphical User Interface (GUI). Following the information given for accessing the GUI, those web pages which deal specifically with chassis functions will be described. Subsequent sections focus specifically on the operation of the SBM-75 in DVB-S2 modes.

4.2 Requirements for Accessing the GUI

Any of the following popular web browsing clients have been tested for accessing the GUI:

- Microsoft Internet Explorer (Version 6 or 7)
- Mozilla Firefox (Version 1.0, 1.5 or 2.0)
- Safari (Version 2.0)
- Opera (Version 9.0)

Note:

The analyser feature (see Section ***) requires Java support. The JRE used must be version 1.4 or higher. Any virtual machine could be used, but the Sun Microsystems JVM is recommended, and is the only one officially supported.

4.2.1 Accessing the GUI

To access the GUI:

1. Enter the IP address or name of the SBR to be controlled in the browser address bar.

Note

The web server of the SBM-75 can be found at the default address http://port followed by the port number i.e. port 80.

The following window is displayed.

Connect to lynx12
The server lynx12 at SBR70 requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
sbt75
Password:
Remember my password
OK
Cancel

Figure 4.1: SBM-75 Login Window

2. Enter the default Username: sbt 75 and the default Password: sbt 75. The entry level screen is displayed. The alarm status of the chassis and each installed functional unit is shown in the monitor bar on the left-hand side of the window.

> **Note**
> If a green tick is displayed in the 'Overview' tab of the monitor bar, this indicates that all equipment is working correctly.

4.3 Overview

4.3.1 Overview: Information

This section describes those web pages which are relevant to the unit chassis as a whole. These are used to view summary information, alarms and status for each installed functional unit.

Unit information may be viewed by selecting the 'Overview' tab from the monitor bar. A window, similar to that shown in *Figure 4.2*, is displayed. In this example one SBM-75s is working correctly as indicated by the green tick.

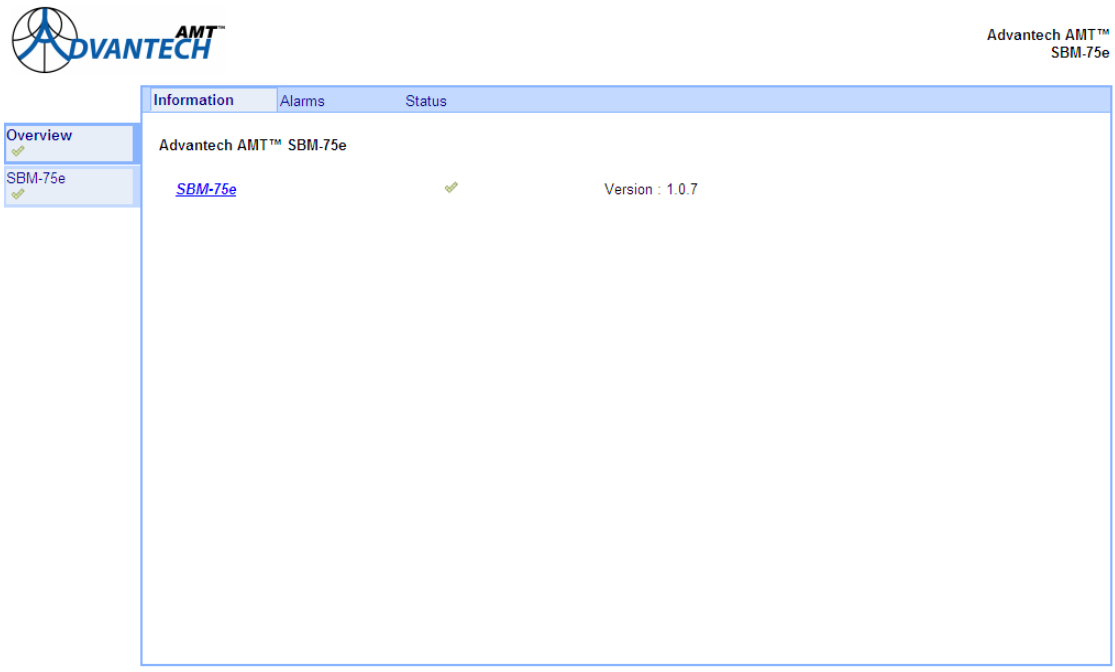


Figure 4.2: Entry Level Window showing Information for the SBM-75

4.3.2 Overview: Alarms

The alarm status of the units displayed in *Figure 4.2* may be viewed by selecting the Alarms tab. A window similar to the one shown in *Figure 4.3* is displayed.

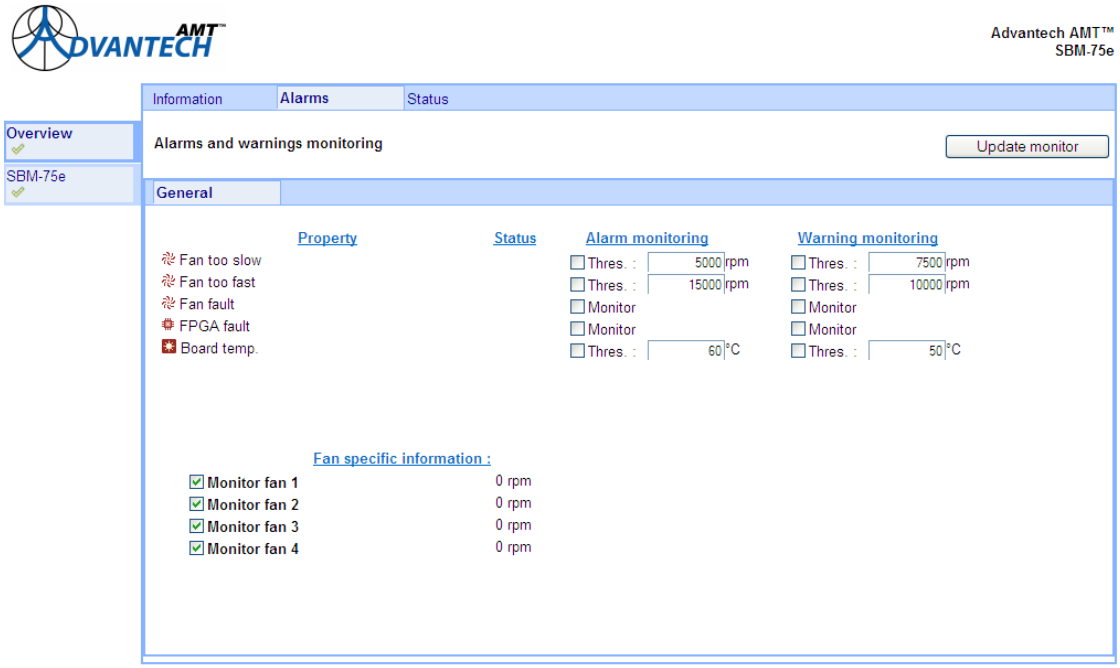


Figure 4.3: Alarms and Warnings Monitoring Window

In this window each of the properties listed may be monitored on two levels - alarm or warning. The thresholds of some of these properties are adjustable by the user. The Status column shows that the 'Fan Fault' alarm status is satisfactory i.e. warning monitoring is not being performed for this property, and that 'Board Temp' alarm and warning monitoring are also satisfactory.

An example is given below to illustrate the process of applying monitoring to other properties on the window.

To apply 'Fan too fast' monitoring to fan number 2:

1. Check the Alarm and Warning boxes in the appropriate row of the window shown above.
2. Check the 'Monitor Fan 2' box.
3. Select the 'Update Monitor' tab on the top right-hand side of the window. A window similar to the one shown in *Figure 4.4* is displayed.

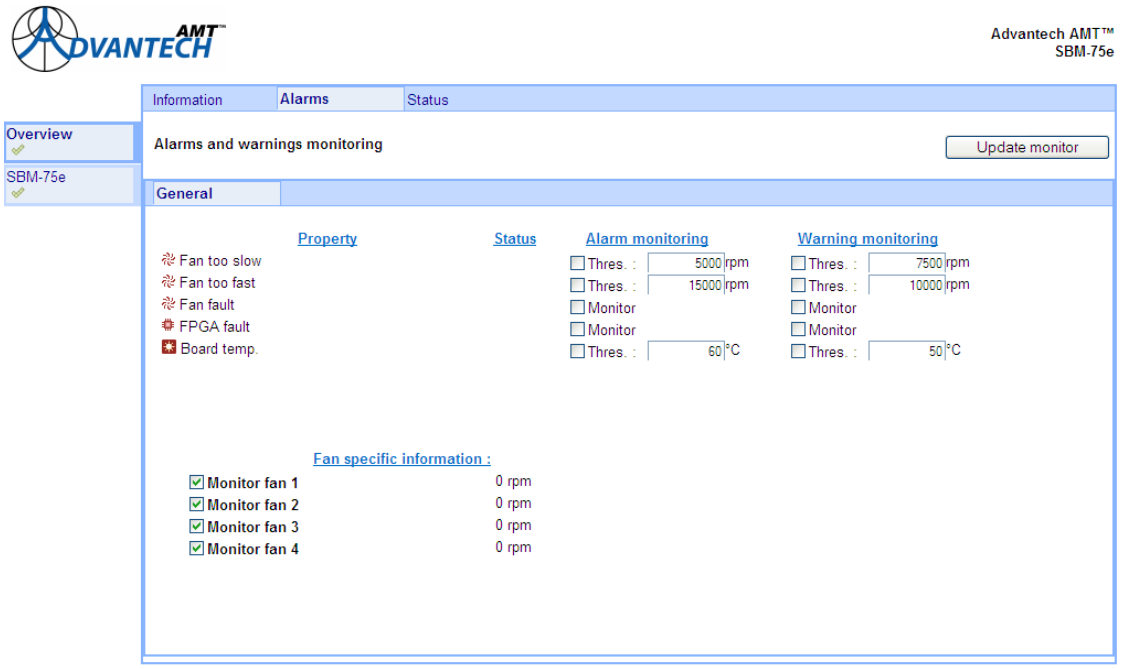


Figure 4.4: Changing Alarm Monitoring Window

Additional information has now appeared in the 'Status' column, indicating that the 'Fan too fast' alarm is clear (shown by the green tick), and that the 'Fan too fast' warning has been asserted (shown by the yellow cross). The 'Overview' tab in the monitor bar on the left of the main panel now reflects this new warning state (shown by a yellow cross and a yellow fan symbol).

4.3.3 Overview: Status

The summary status information for installed functional units may be viewed by selecting the status tab from the Alarm and Warnings Monitoring window. A window, similar to that shown in *Figure 4.5* is displayed.

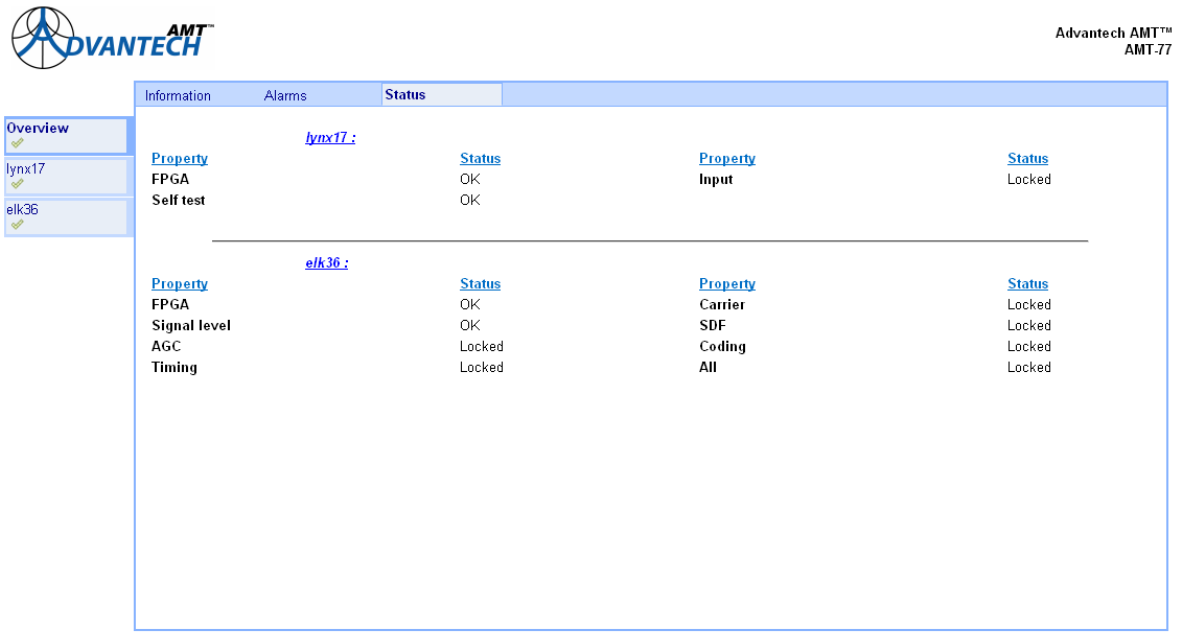


Figure 4.5: Status Window

4.4 SBM-75: Information

The following web page menus are provided to enable the user to view and change the various properties of the SBM-75 functional unit.

4.4.1 Information

By selecting the SBM-75 tab from the monitor bar on the left-hand side of the main panel, the user is able to set the name of the unit, check the software version and available optional features or capture a system snapshot. When the tab is selected, a window similar to that shown in *Figure 4.6* is displayed.

Figure 4.6: SBM-75 Management Window

4.4.1.1 Setting the Unit Name

The default name of the functional unit is SBM-75. The name of the unit may be changed by entering the desired name in the 'Name' box and selecting the 'Update' tab. The new name should appear in the monitor bar on the left-hand side of the main panel as shown in the example in *Figure 4.7.*

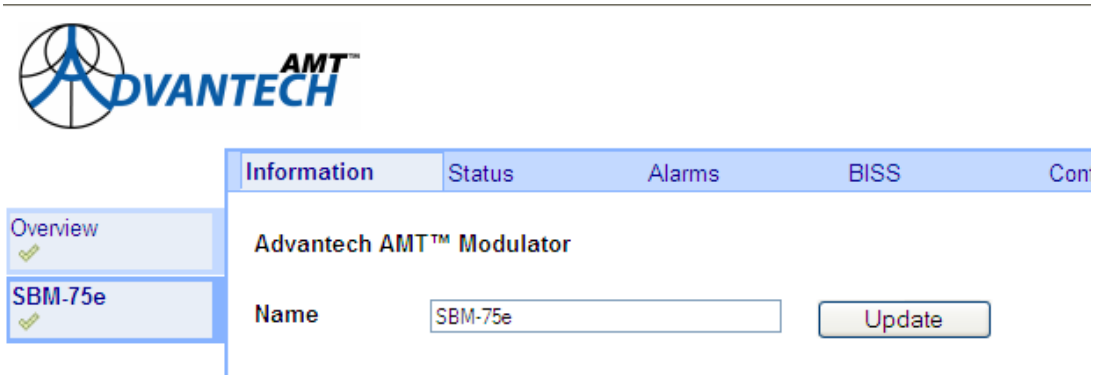


Figure 4.7: Setting the Unit Name Window

4.4.1.2 Version

The relevant software version number is shown in this window.

4.4.1.3 MAC Address

The external MAC address of the Ethernet Interface of the SBM-75 is displayed below the version number in standard 6 octet format.

4.4.1.4 Supported Features

A list of optional features supported by the unit is shown below the MAC address and is detailed in *Table 4.1*.

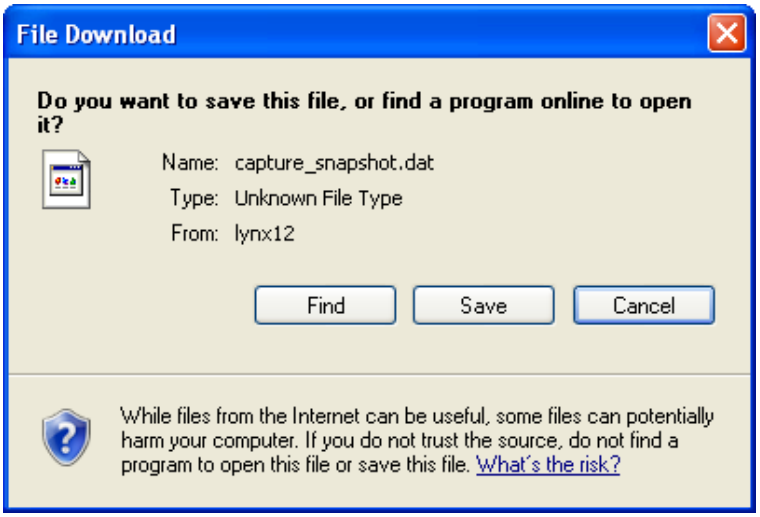
Table 4.1: Optional Supported Features

Feature	Operations
DVB-s	If the text 'DVB-S' is displayed, this indicates that the SBM-75 is able to operate in DVB-S mode.
DVB-S (QPSK, 8PSK)	If the text 'DVB-S (QPSK, 8PSK)' is displayed, this indicates that the SBM-75 is able to operate in this mode.
BISS (Basic Interoperable Scrambling System)	If the text 'BISS' is displayed, this indicates that the SBM-75 is able to operate in this mode.

4.4.1.5 Capture System Snapshot

By activating this link a snapshot of the unit set up will be saved, this will create a binary file which can be sent if there are any support issues.

.


File Download
Do you want to save this file, or find a program online to open it?
Name: capture_snapshot.dat
Type: Unknown File Type
From: lynx12
Find
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

4.4.1.6 Factory defaults

This will put the unit into a default state

4.5 SBM-75: Status

A basic summary of the operation of the SBM-75 may be viewed by selecting the Status Tab from the window shown in *Figure 4.6.* A window, similar to that shown in *Figure 4.8* is displayed.

i

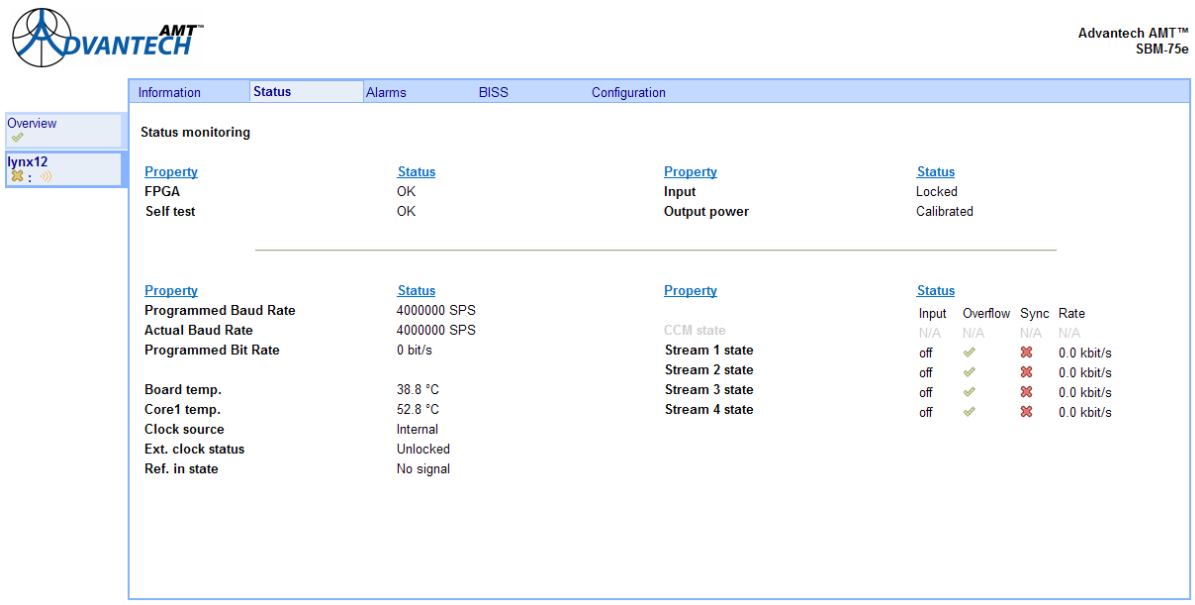


Figure 4.8: SBM-75 Status Window

This page will give a summary of the unit status.

4.5.1 Status monitoring

Table 4.2: Status monitoring values

FPGA		Field Programmable Gate Array have programmed correctly
Self Test		Diagnostic check passed
Input		This will indicate locked if the data rate Is valid otherwise unlocked will be reported.
Output Power		This should always read calibrated. If it reads uncalibrated then please contact support
Programmed Baud Rate		This is the programmed baud rate. If the unit was programmed with a bit rate this is the calculated rate.
Actual Baud Rate		The Actual Baud rate can be proportional to the incoming bit rate and hence may be different to the programmed rate.
Board Temperature		This is the temperature as measured on the modulator card.
Core1 Temperature		This is the temperature on the silicon surface of the FPGA.
Clock Source		Internal: High stability OCXO used for reference
		External: External 10Mhz reference used
		Hold: Stores the frequency of the 10MHz reference.
Ext Clock Source		Indicates if the External 10MHz reference is locked.
Ref. In state		Signal / No Signal. Is there any signal on the reference?
CCM State	Input	N/A: Input not used in this mode
		Off: Input disabled
		Main: Main input in use
		Spare: Redundant input in use
	Overflow	X: Input rate exceeded √: Input rate below limit
	Sync	X: Sync not detected √: Sync Detected
	Rate	Rate in kb/s

4.6 SBM-75: Alarms

From the 'Alarms' window the user may configure alarms and/or warnings based on the behaviour and status of the modulator. Warnings are displayed to the user while alarms initiate the alarm relay.

Alarms or warnings may be viewed by selecting the Alarms tab on the window shown above. A window, similar to that shown in *Figure 4.9 is* displayed.

4.6.1 Setting Alarms

To set an alarm:

1. Check the 'Alarm Monitoring' box next to the property on which you wish to generate an alarm.
2. Change the default alarm threshold, if required. The units of the threshold are displayed to the right of the text entry box.

> **Note**
> Some alarms have no user threshold.

3. Repeat steps 2 and 3 to add all required alarms
4. Select the 'Update Monitor' tab. This is necessary for successful arming of the alarms.

4.6.2 Setting Warnings

To set a Warning:

1. Check the 'Warning Monitoring' box next to the property on which you wish to generate a warning.
2. Change the default warning threshold, if required. The units of the threshold are displayed to the right of the text entry box.

> **Note**
> Some warnings have no user threshold.

3. Repeat steps 2 and 3 to add all required warnings.
4. Select the 'Update Monitor' tab. This is necessary for successful arming of the warnings.

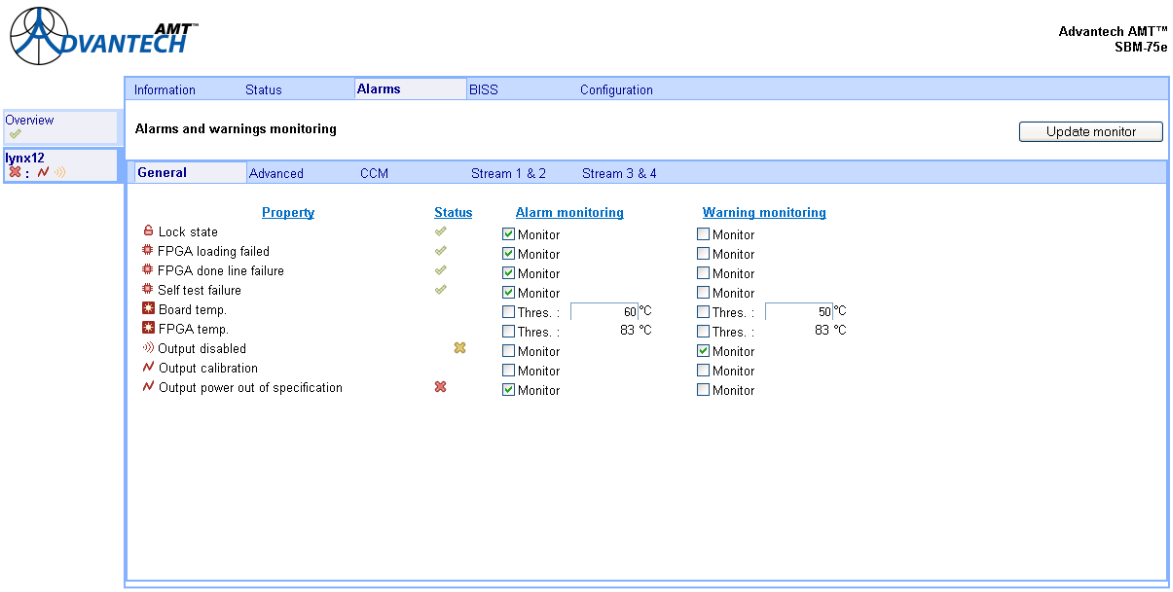


Figure 4.9: Alarms and Warnings Monitoring Window

4.6.3 General

The following paragraphs detail the general alarms shown in *Figure 4.9.*

4.6.3.1 Lock State

This property allows an alarm or warning to be raised if the modulator is unlocked.

4.6.3.2 FPGA Loading Failed

This property allows an alarm or warning to be raised if one or more of the FPGA devices in the modulator fail to configure correctly.

4.6.3.3 FPGA Done Line Failure

This property allows an alarm or warning to be raised if the FPGA devices in the modulator fail to exit the programming mode.

4.6.3.4 Board Temperature

This property allows an alarm or warning to be raised if the temperature of the modulator board exceeds the user specified temperature limit.

4.6.3.5 FPGA Temperature

This property allows an alarm or warning to be raised if the core temperature of one or more of the FPGA devices exceeds the design limit.

4.6.3.6 Output disabled

This property allows an alarm or warning to be raised if the output of the modulator is disabled. For example the input data stream is removed.

4.6.3.7 Output Calibration

This property allows an alarm or warning to be raised if the modulator is uncalibrated

4.6.3.8 Output power out of specification

This property allows an alarm or warning to be raised if the output power level is outside the calibration range.

4.6.4 Advanced Alarms

The alarm/warning properties of the 1:1 redundancy unit may be viewed by selecting the Advanced alarm tab. A window, similar to that shown in *Figure 4.10 is* displayed.

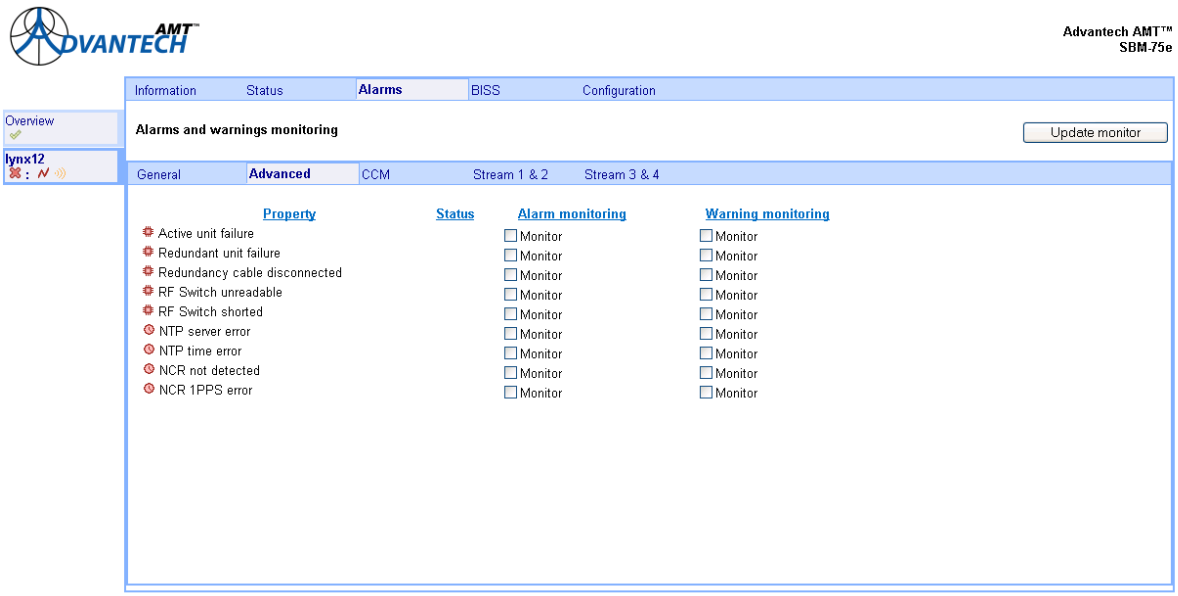


Figure 4.10: Output Alarms Window

4.6.4.1 Active unit failure

This event allows an alarm or warning to be raised if the active unit is not locked.

4.6.4.2 Redundant unit failure

This event allows an alarm or warning to be raised if the redundant unit is not locked.

4.6.4.3 Redundancy cable disconnected

This event allows an alarm or warning to be raised if the redundancy cable is removed.

4.6.4.4 RF Switch unreadable

This event allows an alarm or warning to be raised if the redundancy RF switch can not be monitored.

4.6.4.5 RF Switch Shorted

This event allows an alarm or warning to be raised if the RF switch is shorted.

4.6.4.6 NTP Server error

An alarm or warning will be generated when contact with the NTP server has been lost.

4.6.4.7 NTP Time error

An alarm or warning will be generated when the returned time from the NTP server does not match the internal Time.

4.6.4.8 NCR not detected

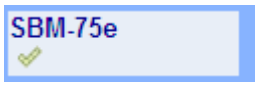
An alarm or warning will be generated when the programmed NCR is not detected.

4.6.4.9 NCR 1pps not detected

An alarm or warning will be generated if the 1PPS is not detected.

4.6.5 Alarm Status

A summary of the alarm and warning status is visible at all times in the monitor bar at the left side of the main panel. If no warnings or alarms are active, the summary for the relevant functional unit should appear as a green tick as shown below.



If any alarms are present, the green tick will be replaced by a red cross and the alarm relay will be activated. If any warnings are present, the green tick will be replaced by a cross, which will be yellow if no alarms are indicated.

4.7 SBM-75: Configuration

4.7.1 Main

The Configuration Main window allows the user to set the conventional modulator parameters such as:

- Carrier frequency and spectrum direction
- Symbol rate
- Modulation and FEC modes
- Alpha, the roll-off factor
- PL scrambling seed

The Configuration window may be viewed by selecting the 'Configuration' tab on the main window. A window, similar to that shown in *Figure 4.11 is* displayed.

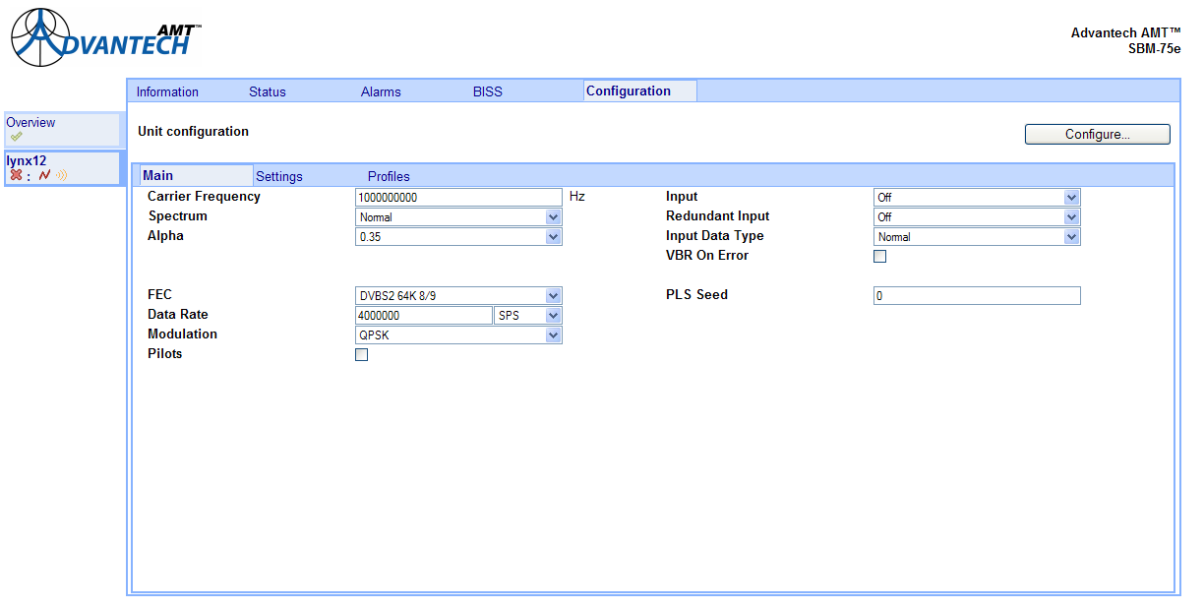


Figure 4.11: Configuration Main Window

4.7.2 Input Data Type

This is the method of locking to the incoming data.

4.7.2.1 VBR

Variable bit rate mode will add Mpeg Null packets to guarantee a fixed symbol rate. The data rate has to be set to SPS, not BPS. The PCR values are re-stamped to meet the PCR jitter requirements. The reset on error tick box is only valid in this mode. If this box is ticked and the input is removed then the output will be disabled - otherwise null packets are transmitted continuously.

204 byte Mpeg packets are automatically accepted and converted to 188 byte packets, the bit rate assumes the transmission of 188 byte packets.

4.7.2.2 Normal

The transmitted carrier is frequency locked to the input data rate. The data rate can be set as BPS or SPS and the calculation is performed. This operation acts as a seed and the actual symbol rate is reported in the status window. The data stream is not modified. In DVB-S2 the data will be transmitted as Transport streams and sync detection is performed.

The VBR on Error tick box will only appear in this mode, when the input is removed and the box ticked then Null packets will be transmitted until the signal is replaced.

204 byte Mpeg packets are automatically accepted and converted to 188 byte packets, the bit rate assumes the transmission of 188 byte packets.

4.7.2.3 Unframed

In DVB-S mode the data is required to be in a MPEG transport stream format i.e. a 0x47 Sync mark every 188 bytes. In Unframed mode a sync mark is inserted which needs to be removed within the demodulator. In DVB-S2 the data is transmitted without modification and no sync detection is performed. The data will be transmitted as Generic Stream Continuous.

4.7.3 Input Type

The input is selected from off, PRBS, ASI1,…,ASIX where X is the number of ASI inputs for the modulator. If PRBS is selected then a Pseudo Random Bit Stream will be generated, if the input type is normal then this pattern will be MPEG framed and transmitted as a Transport Stream. If unframed is selected then it will be transmitted as Generic Stream Continuous.

4.7.4 Redundant Input

The input is selected from off, PRBS, ASI1,…,ASIX where X is the number of ASI inputs for the modulator. If the main input is removed then the unit will switch to the redundant input, which will cause an alarm to be raised. When the main input is restored the unit will continue to use the redundant input until the modulator is reconfigured.

4.7.5 PLS Seed

The DVB-S2 physical layer specification makes provision for the application of user specific physical layer scrambling.

To apply user specific physical layer scrambling:

1. Enter the appropriate value in the PLS Seed Text box on the advanced window. The value of the seed entered must match the value of the seed employed at the corresponding modulator.

4.7.6 ACM

When the FEC is set to either "DVBS2 64K ACM" or "DVBS2 16K ACM" then the following is displayed in Figure 4.12.

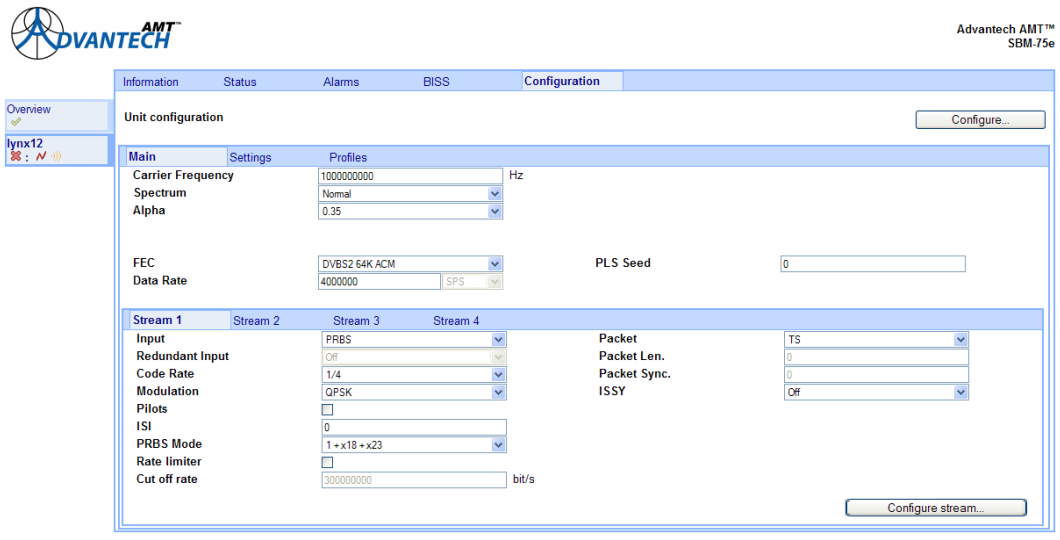


Figure 4.12: ACM Configuration Window

There is now a tab for each stream which can be independently configured without affecting other streams. For each stream can have independent code rate, modulation and pilots but it is worth noting that most DVB-S2 ACM/VCM receivers highly recommend the use of pilots.

Once a stream has been configured then press configure stream, this will only affect the stream in question, all other streams will be unaffected.

4.7.6.1 Input

The selection can be off, PRBS, ASI X for stream X, ASI 1, ASI X L2 and ASI 1 L2. Setting Off will prevent any transmission of that stream. Setting PRBS will output a random stream and the rate will be set by cut off rate if the rate limit is set otherwise the PRBS will fill all available bandwidth.

4.7.6.2 Redundant Input

The input is selected from off or ASI N where N is the redundant ASI pair e.g. for stream 1 the redundant input would be ASI 2. If the main input is removed then the unit will switch to the redundant input, which will cause an alarm to be raised. When the main input is restored the unit will continue to use the redundant input until this stream is reconfigured.

4.7.6.3 ISI

Input Stream Identifier is a value from 0 to 255 which should be unique for each stream. This is defined within the DVB-S2 standard.

4.7.6.4 PRBS Mode

This is the polynomial used for the PRBS sequence. This option is only available if PRBS has been selected for the input.

4.7.6.5 Rate Limiter

When this is selected the data rate will be limited to the rate set in the cut off rate text entry box. This is intended to limit a stream to a set bit rate and prevent it stealing bandwidth from a fellow stream. This is also used to set the bit rate for the PRBS sequence.

4.7.6.6 Cut off rate

This is only available if the rate limiter has been selected. This will set the maximum rate and input will be allowed before data is discarded. The value is set in bits per second. This also sets the rate of the PRBS sequence.

4.7.6.7 Packet

The data can be transmitted as TS (Transport streams), GSC (Generic Stream Continuous) or GSP (Generic Stream Packetised).

4.7.6.8 Packet Len

This mode is only valid if the packet selected is GSP. It sets the packet length in bytes.

4.7.6.9 Packet Sync

This mode is only valid if the packet selected is GSP. It sets the Sync mark expected in the incoming data stream.

4.7.6.10 ISSY

Input Stream Synchronisation (ISSY) is a time stamp used for a constant delay when using ACM/VCM. It is recommended that it be used for Video. Short adds 2 bytes per MPEG packet while Long adds 3 bytes per packet.

4.7.7 Profiles

This option allows the user to save and recall a variety of operational profiles and exchange profiles between different chassis via a host computer. To make use of this option the Profiles tab may be selected from the main configuration window. A window, similar to that shown in *Figure 4.12* is displayed.

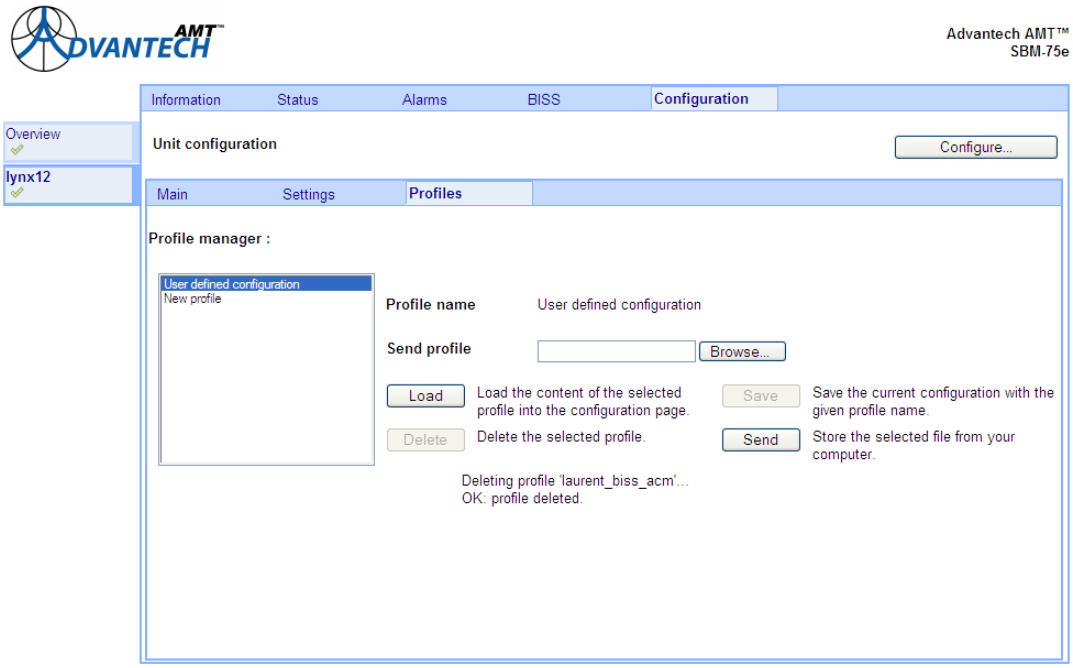


Figure 4.13: Profiles Main Window

4.7.7.1 Saving and Overwriting Profiles

When modulator configuration is complete, the user can save the configuration into a named profile.

To create a new profile:

1. Select the 'New Profile' option from the list shown in *Figure 4.12.*
2. Enter a profile name (e.g. MuxA) in the adjacent text box.
3. Select 'Save'. The new profile will appear in the profile list as shown in *Figure 4.13.*

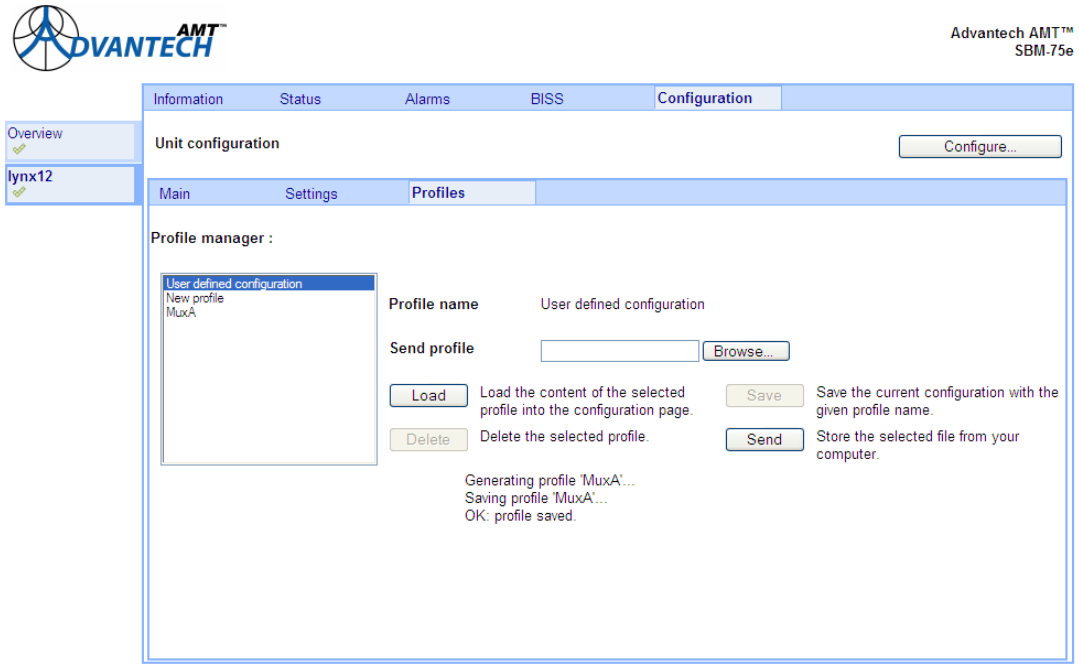


Figure 4.14: Saving a New Profile

To overwrite an existing profile:

1. Select the profile to be overwritten from the main Profiles window.
2. Enter a new profile name (e.g. MuxA) in the adjacent text box.
3. Select 'Save'.

4.7.7.2 Loading Existing Profiles

To load an existing named profile:

1. Select the profile to be loaded from the main Profiles window. A window similar to that shown in *Figure 4.14* is displayed.
2. Select 'Load'.
3. Select 'Configure' to activate the profile.

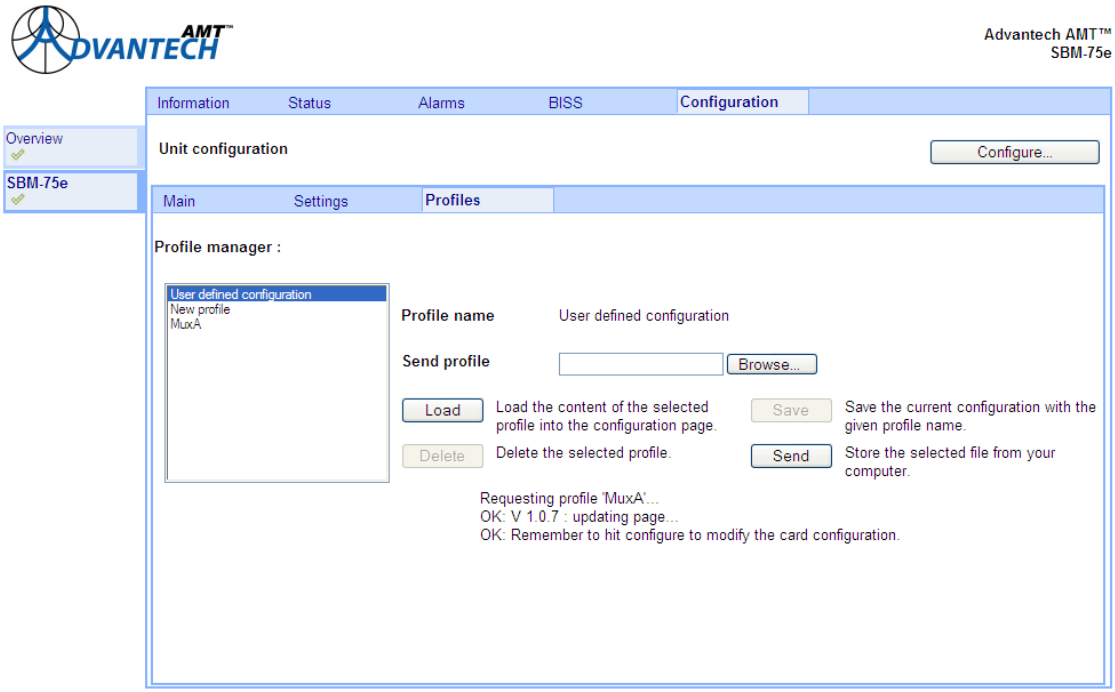


Figure 4.15: Loading an Existing Profile

4.7.7.3 Downloading a Profile

Occasionally it is necessary to clone a profile, or a set of profiles, amongst a family of units.

To clone a profile:

1. Select the profile to be cloned from the profiles main window. A window similar to that shown in *Figure 4.15* is displayed.

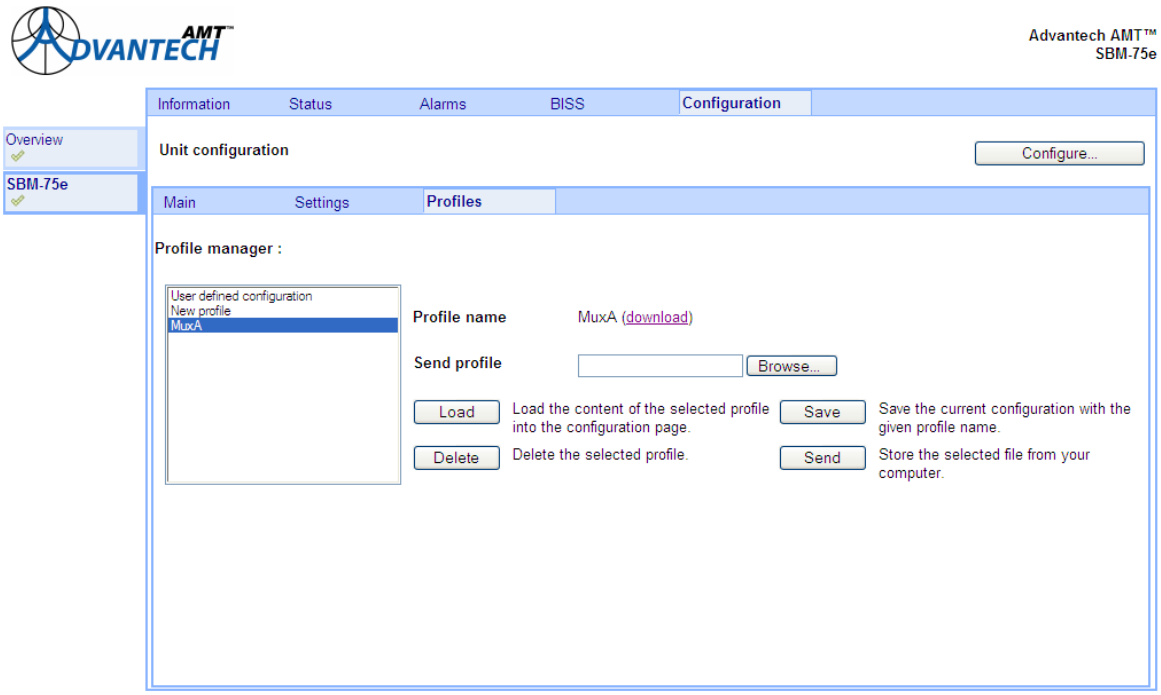


Figure 4.16: Downloading a Profile

2. Select the Download link. A window similar to that shown in *Figure 4.16* is displayed.

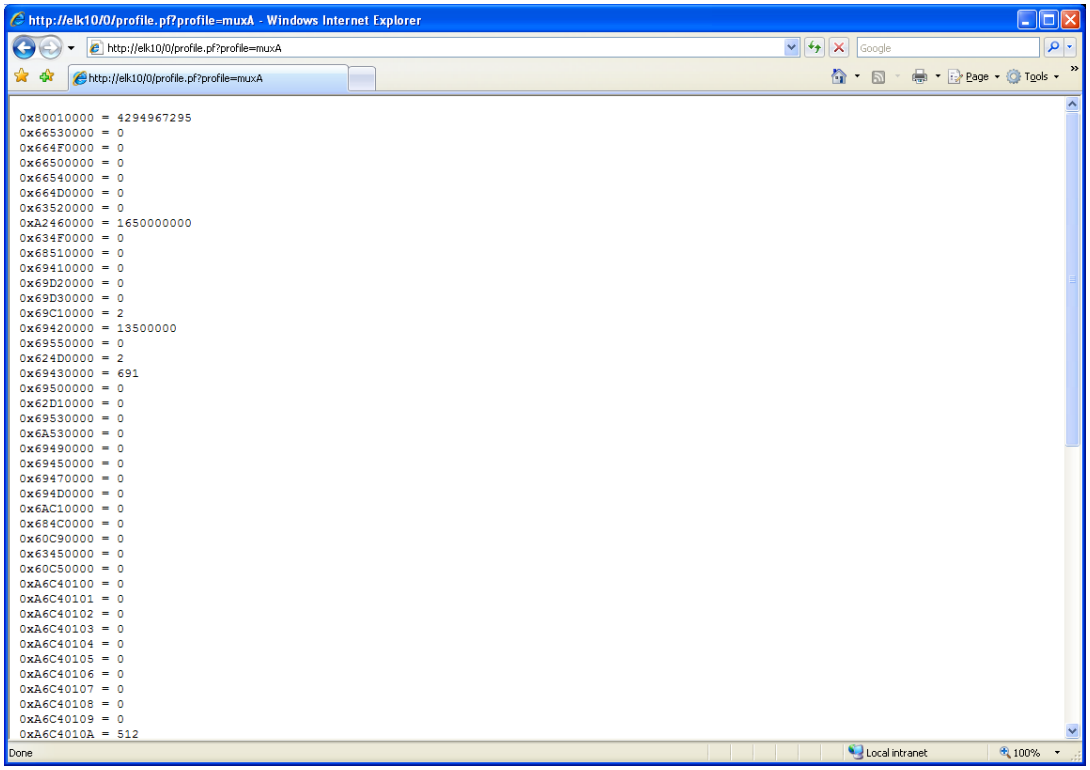


Figure 4.17: Downloaded Profiles List

3. Select all displayed files and save to a network file.

4.7.7.4 Uploading a Profile

Uploading is essentially the second stage in cloning a profile.

To upload a profile:

1. Select the 'Browse' button. A window similar to that shown in *Figure 4.17* is displayed.

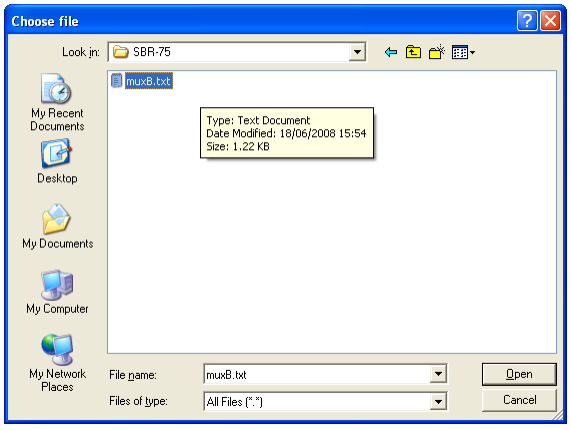


Figure 4.18: Choose file Window

2. Select the file selected in the download operation.
3. Select 'Send' to upload the file and create a new profile.

4.7.7.5 Factory Defaults

This is a special profile which cannot be deleted or modified.

4.7.8 Settings

The output levels of the SBM-75 may be viewed and set by selecting the Output Tab from the main Configuration window. A screen similar to that shown in *Figure 4.18* below is displayed.

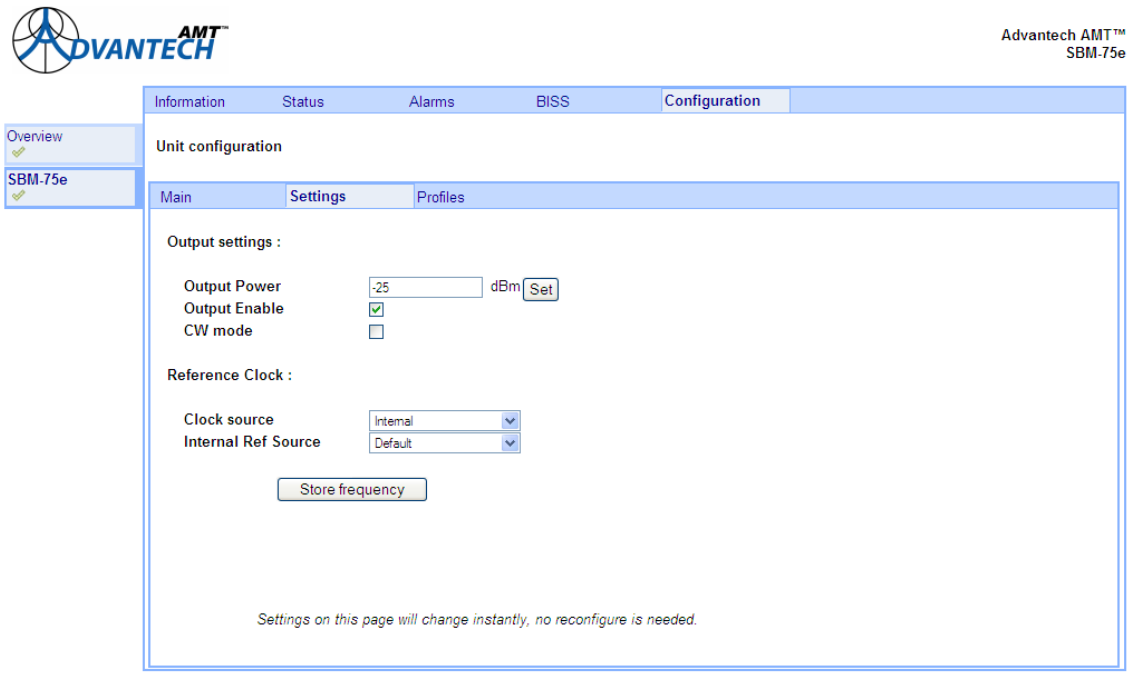


Figure 4.19: Output Window

4.7.8.1 Output Power

The output power may be set by entering the required level in dBm and selecting Set. The current calibrated range is -25 dBm to 0 dBm but you can enter values outside of this range, an alarm can be triggered if desired when this occurs.

4.7.8.2 Output Enable

The Output Level may be disabled by un-checking the appropriate box. This setting will take effect instantaneously.

4.7.8.3 CW Mode

The Continuous Wave (CW) test mode may be enabled by checking the appropriate box. This setting will take effect instantaneously.

4.7.8.4 Clock source

A highly accurate internal clock source can be used by selecting Internal or an External 10 MHz reference can be used by selecting External. If an external reference is used then this frequency can be held by selecting hold, this would then allow the external reference to be removed.

4.7.8.5 Internal Ref. Source

The Internal timing can either be free running or aligned to a stored frequency which was derived from an external reference and then stored via the store frequency button.

4.8 BISS Encryption

Basic Interoperable Scrambling System (BISS) is a satellite signal scrambling system developed by the European Broadcasting Union and a consortium of hardware manufacturers.

When using BISS the transmission is protected by a 12 digit "session word" that is agreed by the transmitting and receiving parties prior to transmission. The key is entered into both the encoder and decoder, this key then forms part of the encryption of the digital TV signal and only receivers with the correct key will decrypt the signal.

The rapid increase in the use of Digital Satellite News Gathering (DSNG) technology resulted in the availability of digital codec equipment from a number of vendors. At the same time, the absence of standard methods for the securing and scrambling of DSNG broadcasts spawned the development of several different proprietary security mechanisms. The widespread acceptance of DVB standards made it possible to propose and provide a security mechanism that offered interoperability between the equipment of different DSNG vendors. This enabled broadcasters to combine equipment from several vendors, while making systems more future-proof.

BISS is based on the DVB-CSA specification, and the use of fixed clear keys called Session Words (SWs). BISS specification Mode 1 is used for DSNG. BISS specification Mode E (BISS with Encrypted keys – referred to as BISS-E) introduces an additional mechanism to accept the insertion of Encrypted Session Words (ESWs) while, at the same time, conserving interoperability. This mechanism is backward compatible with BISS specification Mode 1.

The BISS option will appear on the tabs if the feature key is installed and may be viewed by selecting the BISS tab. A window similar to the shown in *Figure 4.20* is displayed. The BISS window can be split into 3. The top is for selecting the BISS mode, the middle is a status view and the bottom is an application for generating Encrypted Session words.

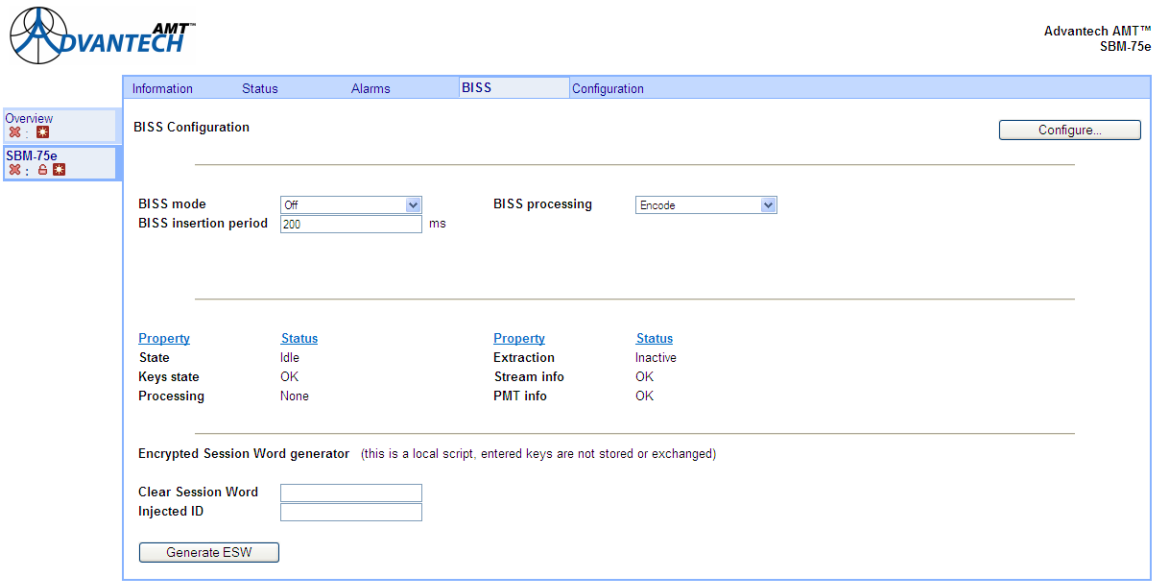


Figure 4.20: BISS Window

4.8.1 BISS Mode Selection

The options for the BISS mode are Off, Mode-0, Mode-1, Mode-E, Odd/Even-1, Odd/Even-E, User-1 and User-E. Depending upon the selection, the available options will change within this section of the window.

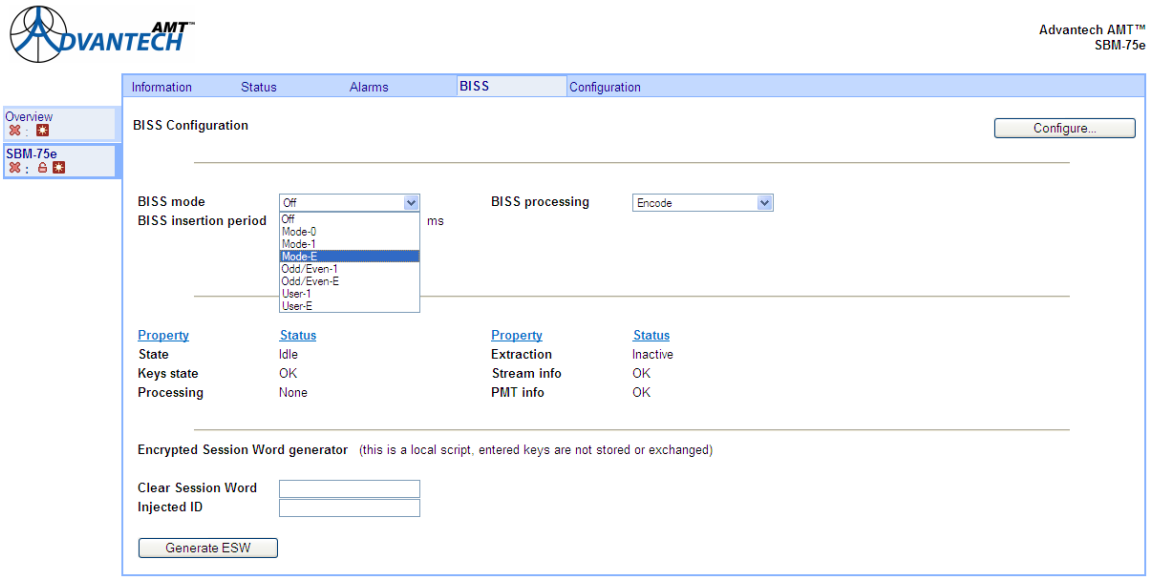


Figure 4.21: BISS Mode Selection Window

Note

All session words, injected ID and Encrypted session words cannot be read back and are not echoed back to the display. These values are also not stored in the profiles but will be reused after a power cycle. To comply with the specification the keys cannot be changed more than ten times in a 5-minute period and that there is a minimum of 10 seconds between changes. The keys are transmitted in the clear via the GUI so should be used with caution, perhaps by setting the Injected ID up only on the front panel and never via the GUI.

4.8.2 Off

BISS is fully disabled and the transport stream will be unmodified. If BISS is subsequently enabled then the modification in the transport stream may cause a momentary glitch in the video. It is preferable to use BISS-0 which will modify the transport stream without encrypting the video.

4.8.3 BISS-0

The transport stream will not encrypt in this mode but is modified to add signalling about BISS. In this mode encryption can be enabled seamlessly.

4.8.4 BISS-1

The transport stream is encrypted using the session word which is a 12 digit hex value. If the key is not present then the last entered value will be used. This session word is independent from the key generated when using BISS-E and will be retained.

4.8.5 BISS-E

The transport stream is encrypted by a calculated session word. This session word is generated from an injected ID and an Encrypted session word. This is fundamentally more secure as both the Injected ID and Encrypted session words are required for decryption and each receiver could have a unique Encrypted session word. The Injected ID is a 14 digit Hex value and the Encrypted Session Word (ESW) is a 16 digit hex value. If the key or the ID is not present then the last entered values will be used.

4.8.6 Odd/Even-1

This mode is not part of the BISS standard but has been successfully interoperated with other manufacturers who have similar variants. Each MPEG packet has a field in the header which indicates if it is in the clear, encrypted using an ODD key or encrypted using an even key. While BISS only uses the one key, this mode allows two independent keys. The advantage of this mode is that it allows keys to be programmed offline while using the other key for decryption. Both the odd and the even session word will require a 12 digit hex value. The even key is the same key as that used for BISS-1.

4.8.7 Odd/Even-E

Odd/Even-E also uses the odd and even keys in the same way as Odd/Even-1 mode but each key is encrypted using the same Injected Id. The Injected Id will require a 14 digit hex value and the ESWs will both require 16 digit hex values. The even key is the same key as used for BISS-E.

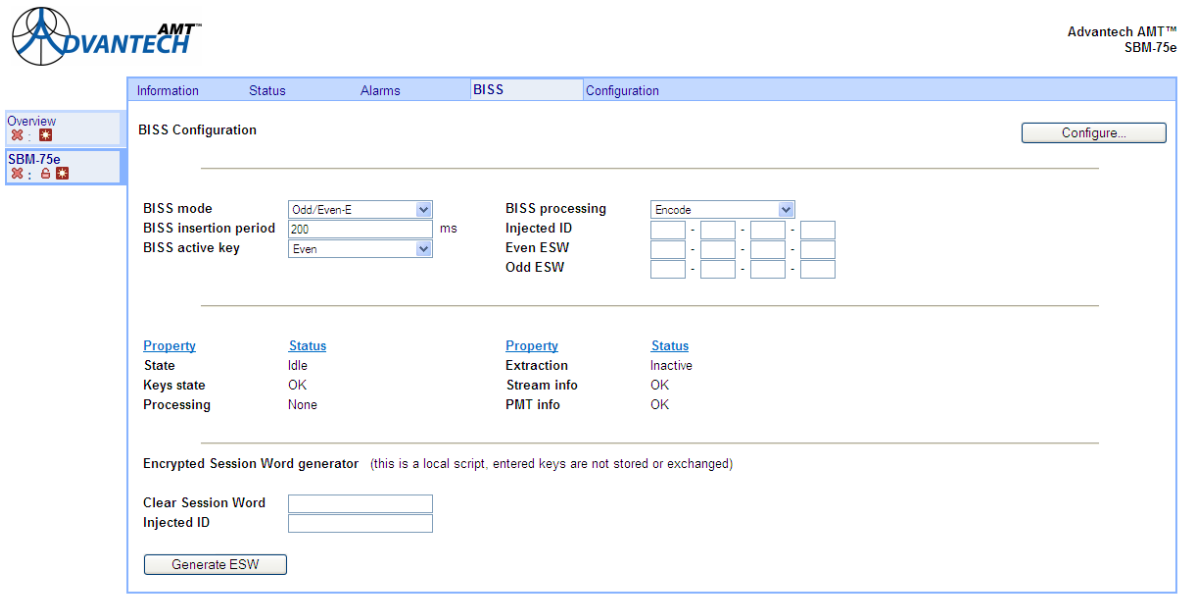


Figure 4.22: Odd/Even-E Selected

4.8.8 User-1

This enables a specific user mode where specific PIDs are decrypted. The SI information is not altered so this mode is not BISS compliant. The actual PIDs to be decrypted are specified only on the command line. A 12 digit hex value is required for the session word. The even key is the same key as used for BISS-1.

This mode is used to guarantee that the decrypted transport stream will match the original.

4.8.9 User-E

This is identical to the User-1 mode except a 16 digit hex value is required for the ESW and a 14 digit hex value is required for the injected ID. The even key is the same key as used for BISS-E.

4.8.10 BISS Insertion Period

This sets the frequency that the Program Association Table (PAT), Programme Map Table (PMT) and Conditional Access Table (CAT) will be inserted into the stream. The default is 200 ms and this value should be suitable in most circumstances.

4.8.11 BISS Active Key

When the BISS Mode is either Mode-E or ODD/EVEN-E or User-E then the BISS Active Key can be selected. This determines which key shall be used.

4.8.12 BISS Status

Table 4.3: BISS Status

Property	Status	Description
State	Uninitialized	Error condition, BISS failure
	Idle : illegal in this mode	BISS cannot be used in this mode
	Idle	BISS is turned off
	Configured	BISS is active, this will include BISS-0 Mode
Extraction	Active	SI extraction is active
	Inactive	no SI extraction
Keys	OK	Valid keys present, this should always be OK
stream info	PAT not found	The PAT is not detected, critical failure
	Corrupted tables	At least one of the PMT listed in the PAT cannot be extracted or At least one of the PMT has a bad structure or a CRC error
	No CAT detected	CAT is not found, this can be normal
	OK	Transport stream is OK
processing	Ciphering	The block cipher is engaged and ciphering
	Unciphering	The block cipher is engaged and deciphering
	None	The block cipher is not engaged
PMT info	Too many PMT(s)	too many PMT(s) are received for the playout RAM (overflow)
	Incorrect PMT(s)	A PMT cannot be modified to add/remove BISS SI (PIDs listed in the PMT would not be ciphered/deciphered)
	Missing PMT(s)	A PMT listed in the PAT could not be retrieved
	OK	All is OK

4.8.13 Encrypted Session Word Generator

The Encrypted Session Word generator is an application which runs locally on the web browser and requires no network access. Consequently, the generated keys will have to be manually programmed into the unit via the front panel, GUI, SNMP or CLI. A 12 digit Hex value is entered in the Clear Session Word field and a 14 digit hex value is entered in the injected ID field. Clicking on the Generate ESW Key will produce a 16 digit hex value.

Note

This process requires a random seed which will produce a different ESW every time it is generated. It is not deterministic. No keys are stored in this process.

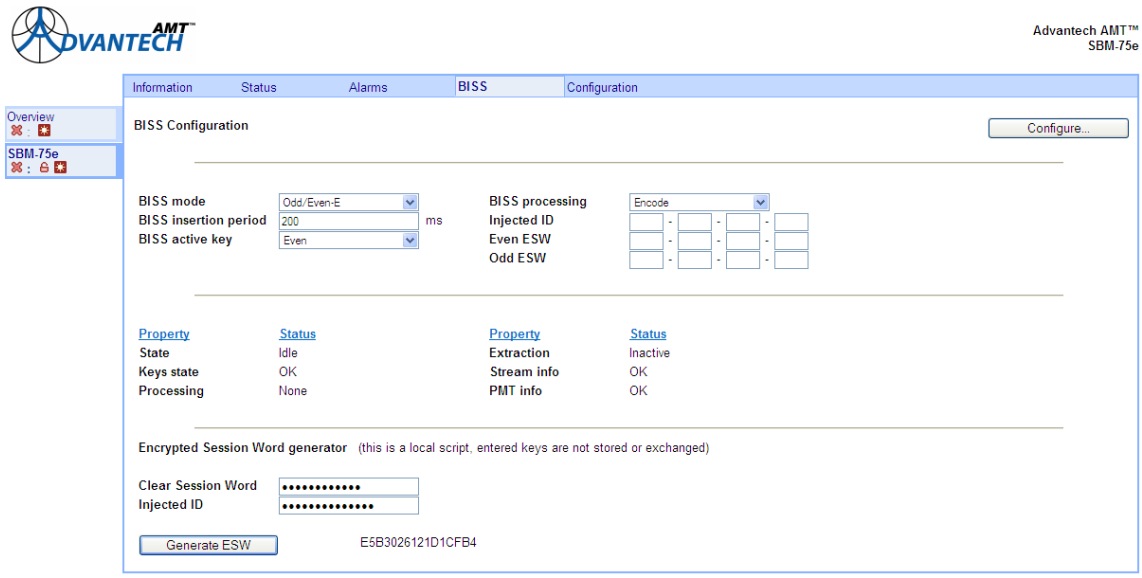


Figure 4.23: Encrypted Word Session Generator Window

APPENDIX A: Technical Specification

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A.2 Technical Specification A-2

A.3 Standards Compliance A-3

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Table A.1: Technical Specification A-2

A.1 Introduction

This chapter details the technical specification and the standards with which it is compliant.

A.2 Technical Specification

The following table details the technical specification.

Table A.1: Technical Specification

Description	Specification
Modulator	
Data Rate	16 Kbps to 200 Mbps
Data Rate Options	16 kbps to 10 Mbps, 20 Mbps, 52 Mbps and 140 Mbps
Symbol Rate	128 KSymbol to 40 MSymbol
Data Interfaces	ASI (standard) (Optional to support up to 8)
Local / Remote Monitor & Control Interfaces	9 pin D-sub (F) for RS-232 Serial interface 9 pin /d-sub (F) for RS-485 Serial interface (Terminal mode and packet protocol mode) 9 pin D-sub (F) for Alarm interface (switch-over contact) 15 pin D-sub (F) for redundancy connector RJ-45 10/100BaseT Ethernet
Data Connector	BNC (F) - 75 Ω for ASI and E3/T3 G.703 interfaces
DVB-S2 Modulation Type & FEC Rate	**Continuous Wave (CW)** **QPSK:** 64 Kbps to 80 Mbps DVB-S2 SHORT and NORMAL FEC Block SHORT Block 16kbit ¼, $^{1}/_{3}$, $^{2}/_{5}$, $^{1}/_{2}$, $^{3}/_{5}$, $^{2}/_{3}$, $^{4}/_{5}$, $^{5}/_{6}$, $^{8}/_{9}$ NORMAL Block 64kbit ¼, $^{1}/_{3}$, $^{2}/_{5}$, $^{1}/_{2}$, $^{3}/_{5}$, $^{2}/_{3}$, $^{4}/_{5}$, $^{5}/_{6}$, $^{8}/_{9}$, $^{9}/_{10}$ **8PSK:** 256 kbps to 120 Mbps DVB-S2 SHORT and NORMAL FEC Block SHORT Block 16kbit $^{3}/_{5}$, $^{2}/_{3}$, $^{3}/_{4}$, $^{5}/_{6}$, $^{8}/_{9}$ NORMAL Block 64kbit $^{3}/_{5}$, $^{2}/_{3}$, $^{3}/_{4}$, $^{5}/_{6}$, $^{8}/_{9}$, $^{9}/_{10}$ **16APSK:** 340 kbps to 160 Mbps DVB-S2 SHORT and NORMAL FEC Block SHORT Block 16kbit $^{2}/_{3}$, $^{3}/_{4}$, $^{4}/_{5}$, $^{5}/_{6}$, $^{8}/_{9}$ NORMAL Block 64kbit $^{2}/_{3}$, $^{3}/_{4}$, $^{4}/_{5}$, $^{5}/_{6}$, $^{8}/_{9}$, $^{9}/_{10}$ **32APSK:**

Description	Specification
	470 kbps to 200 Mbps DVB-S2 SHORT and NORMAL FEC Block SHORT Block 16kbit $^{3}/_{4}$,$^{4}/_{5}$,$^{5}/_{6}$,$^{8}/_{9}$ NORMAL Block 64kbit $^{3}/_{4}$,$^{4}/_{5}$,$^{5}/_{6}$,$^{8}/_{9}$,$^{9}/_{10}$
Modulation Type & FEC Rate	**QPSK :** DVB 1/2, 2/3, 3/4, 5/6, 7/8 with RS (204,188), Optional **8PSK:** DVB-DSNG PTCM Rate 2/3, 5/6, 8/9 with RS(204,188), Optional **16QAM, Optional:** DVB-DSNG PTCM Rate 3/4, 7/8 with RS(204,188) code
Modulation Roll-Off Factor	12% to 35% with 1% resolution
Configurable Forward Error Correction	DVB-S/DVB-DSNG Coding DVB-S2 SHORT and NORMAL FEC Block SHORT Block 16kbit $^{1}/_{4}^{*}$,$^{1}/_{3}^{*}$,$^{2}/_{5}^{*}$,$^{1}/_{2}^{*}$,$^{3}/_{5}$,$^{2}/_{3}$,$^{4}/_{5}$,$^{5}/_{6}$,$^{7}/_{8}$,$^{8}/_{9}$ NORMAL Block 64kbit $^{1}/_{4}^{*}$,$^{1}/_{3}^{*}$,$^{2}/_{5}^{*}$,$^{1}/_{2}^{*}$,$^{3}/_{5}$,$^{2}/_{3}$,$^{4}/_{5}$,$^{5}/_{6}$,$^{7}/_{8}$,$^{8}/_{9}$,$^{9}/_{10}$ * Only available in QPSK according to DVB-S2 Specification
Data Management Interfaces	
Monitoring & Control (M&C)	**Front Panel:** as standard **External M&C Interface:** 10/100Base-T, RS-232, RS-485, SNMP
Receiver ASI Interface	**Encoded Line Rate:** 270 MSymbol ± 100 ppm **Min Sensitivity (D21.5 idle pattern):** 200 mV **Max Input Voltage:** 880 mV p-p **Discrete Connector Return Loss:** ≥15 dB **Max. Distance:** 150 m
Power, Physical & Environmental	
Power	**AC option:** Auto sensing 95-265 V AC, 50-60 Hz **DC option:** 48 V DC nominal (range +32 to +72 V DC) **Typical Power Dissipation** 25 W
Physical	The SBM75e is a rack-mountable 1RU EIA chassis. **Height:** 4.4 cm (1.75”) **Width:** 43.2 cm (17”) without ears and 48.26 cm (19”) with ears **Depth:** Configuration Dependent – 40.6 cm (16”) to 50.8 cm (20”) max. **Weight:** 5 kg (11lb) maximum
Environmental	**Operating:**

Description	Specification
	Temperature: 0°C to 45°C (32°F to 122°F) **RH:** up to 90% non-condensing **Altitude:** Up to 3,045 m (10,000 ft) **Storage / Transit:** **Temperature:** -25°C to 85°C (-13°F to 185°F) **RH:** up to 95% non-condensing **Altitude:** Up to 12,180 m (40,000 ft)

A.3 Standards Compliance

The AMT-70 modem is compliant to the following Telecommunication Interface Standards:

- IEEE RS-422 / RS-449 / RS-530 and CCITT/ITU V.35 interface standards
- 10/100Base-T Ethernet: *IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*
- DVB-DSNG: *ETSI Standards EN310 210 v1.1.1 Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for Digital Satellite News Gathering (DSNG) and other contribution applications by satellite*

APPENDIX B: Glossary

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Table B.1: Glossary B-2

B.1 Introduction

This appendix provides a brief explaination of the abbreviations and technical terms used in this manual

B.2 Abbreviations and Technical Terms

The following table details the glossary.

Table B.1: Glossary

Term	Description
16-QAM	**16 Quadrature Amplitude Modulation:** A modulation scheme used for the transmission of digital data, which modifies the amplitude and phase of an RF sinusoidal carrier frequency to represent data symbols. 4 different phases and 4 different amplitudes are used for a total of 16 possible symbols.
8-PSK	**8 Phase Shift Keying:** A modulation scheme used for the transmission of digital data, which modifies the phase of an RF sinusoidal carrier frequency to represent data symbols. 8 different phases are used for a total of 8 possible symbols.
ASI	**Asynchronous Serial Interface**. A streaming data format which often carries an MPEG Transport Stream (MPEG-TS). It is electrically identical to an SDI signal and is always 270 Mbit/s. There are two transmission formats commonly used by the ASI interface, the 188 byte format (more common) and the 204 byte format (optional data included).
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bit-rate when the symbols only have two states (1 and 0). Measured in Baud.
BDC	**Block Down-Converter:** A component of a dish antenna that downconverts the output of a LNA to a suitable frequency to communicate to an Receiver, Demodulator or IRD (typically L-BAND 950 MHz - 1600 MHz).
BER	**Bit Error Rate:** A measure of transmission quality. The number of erroneous bits received divided by the total number of bits transmitted over a link. It is generally shown as a negative exponent, (e.g., BER = 10^{-7} means that 1 in 10,000,000 bits are in error).
BISS	**Basic Interoperable Scrambling System:** A satellite signal scrambling system developed by the European Broadcasting Union and a consortium of hardware manufacturers. EBU (Tech3290). Using BISS the transmission is protected by a 12 digit "session key" that is agreed by the transmitting and receiving parties. The key is entered into both the encoder and decoder, this key then forms part of the encryption of the digital TV signal and only receivers with the correct key will decrypt the signal.
Bit-rate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.

Term	Description
BPSK	**Binary Phase Shift Keying:** A modulation technique used to communicate data over long distances by altering the phase of a carrier signal according to the data binary states. The simplest form of phase shift keying, it uses two phases which are separated by 180° and so can also be termed 2-PSK. Sometimes called PRK, Phase Reversal Keying.
BW	**Bandwidth:** The transmission capacity of an electronic line such as (among others) a communications network, computer bus, or broadcast link. It is expressed in bits per second, bytes per second or in Hertz (cycles per second). When expressed in Hertz, the frequency may be a greater number than the actual bits per second, because the bandwidth is the difference between the lowest and highest frequencies transmitted. High bandwidth allows fast transmission or high-volume transmission.
CA	**Conditional Access:** The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
C-Band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 5.250-5.925 GHz (as defined by the ITU). Used by communications satellites and preferred in tropical climates because it is not susceptible to fading.
CRC	**Cyclic Redundancy Check:** An error-detecting code use to check the accuracy of transmitted, or stored, data. An algorithm computes a numerical value based on the data bits in a block of data. This number is then added to the block of data as check bits and transmitted across the link. The receiver uses the check bits, and the same algorithm, to check the accuracy of the received data by comparing the results of the algorithm and the data received. If a mismatch occurs, an error in transmission is presumed.
dB	**Decibels:** A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 600Ω. 0 dBmV is 1 mV terminated in 75Ω.
DCE	**Data Communications Equipment:** A classification of equipment used by the RS-232 standard (and others) to identify equipment types and their communications interface requirements. It establishes, maintains and terminates a session on a network but is not the source (see DTE) or destination (transmission circuit) of signals. A DCE device may typically be a modem, a codec, or convert signals to comply with the transmission path (network) format.
DCT	**Discrete Cosine Transform:** A technique for expressing a waveform as a weighted sum of cosines. Raw video data is not readily compressible. DCT is not in itself a compression technique but is used to process the video data so that it is compressible by an encoder. DCT processes the picture on an 8x8-pixel block basis, converting the data from an uncompressible X Y form (as displayed by an oscilloscope) to a compressible frequency domain form (as displayed by a spectrum analyser). Can be forward DCT or inverse DCT.

Term	Description
Decoder	A unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
Differential Coding	Method of coding using the difference between the value of a sample and a predicted value.
DIL	**Dual In Line:** The most common type of package for small and medium scale integrated circuitS. The pins hang vertically from the two long sides of the rectangular package, spaced at intervals of 0.1 inch.
DIN	**Deutsches Institut für Normung:** German Standards Institute.
Downlink	The part of the satellite communications circuit that extends from the satellite to an Earth station.
Downconverter	A unit containing the electronic circuitry necessary to transform the carrier frequency of a broadcast transport stream from a high (radio) frequency - suitable for long-distance transmission - to a low (intermediate) frequency - suitable for extraction of the data.
DSNG	**Digital Satellite News-Gathering.**
DTE	**Data circuit Terminating Equipment:** A classification of equipment used by the RS-232 standard (and others) to identify equipment types and their communications interface requirements. A communications device that originates (is the source) or is the end receiving unit (destination) of signals on a network. It is typically a terminal or computer.
DTH	**Direct-To-Home.** The term used to describe uninterrupted transmission from the satellite directly to the subscriber, that is, no intermediary cable or terrestrial network utilised.
DVB	**Digital Video Broadcasting:** A European project which defines transmission standards for digital broadcasting systems using satellite (**DVB-S**), cable (**DVB-C**) and terrestrial (**DVB-T**) medium, created by the EP-DVB group and approved by the ITU. It specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
DVB-S2	**Digital Video Broadcasting – Satellite – Second Generation:** An enhanced specification to replace the DVB-S standard, developed in 2003 and ratified by ETSI (EN 302307) in March 2005. The development of DVB-S2 coincided with the introduction of HDTV and H.264 (MPEG-4 AVC) video codecs. The system allows transmission of one or more MPEG-2 audio/video streams, using QPSK or 8PSK or MAPSK (M-ary amplitude and phase shift keying) modulation with concatenated encoding.
DVB SI	**Digital Video Broadcasting Service Information.**
DVB-PI	**DVB-Professional Interfaces:** TTV Lan search shows – DVB Physical Interfaces

Term	Description
Earth	**Technical Earth:** A connection that ensures all equipment chassis within a rack are at the same potential ("commoned"), usually by connecting a wire between the technical earth terminal and a suitable point on the rack. Also called a **Functional Earth**. **Protective Earth:** A connection that ensures all exposed conductive surfaces are at the same electrical potential as the surface of the Earth, to avoid the risk of electrical shock if a person touches a device in which an insulation fault has occurred. In the vent of an insulation fault (a "short circuit"), a very high current flows, which triggers an overcurrent protection device (fuse, circuit breaker, etc.) that disconnects the power supply. Also called a **Safety Earth**.
EBU	**European Broadcast Union.**
EIA	**Electronics Industries Association** (USA)**.**
EMC	**Electromagnetic Compatibility.**
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.
Ethernet	The most widely used local area network (LAN) defined by the IEEE as the 802.3 standard. Transmission speeds vary according to the configuration. Ethernet uses copper or fibre-optic cables.
ETSI	**European Telecommunications Standards Institute.** Body created in 1988, responsible for standardization of Information and Communication Technologies (ICT) within Europe. These technologies include telecommunications and broadcasting.
FCC	**Federal Communications Commission.** A US government agency, established by the Communications Act of 1934 and is responsible for regulating all non-Federal Government use of the radio spectrum (including radio and television broadcasting), and all interstate telecommunications (wire, satellite and cable) as well as all international communications that originate or terminate in the United States.
FDM	**Frequency Division Multiplex:** A common communication channel for a number of signals, each with its own allotted frequency.
FEC	**Forward Error Correction:** A method of detecting and correcting errors in a transmission. The data to be transmitted is processed through an algorithm that generates code bits that are added to the message. The code bits are used at the receiving end to check the accuracy of the transmission and correct any errors.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	**File Transfer Protocol:** A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
G.703	The ITU-T standard which defines the physical and electrical characteristics of hierarchical digital interfaces.

Term	Description
GUI	**Graphical User Interface:** The use of pictures rather than just words to represent the input and output of a program. A program with a GUI runs under a windowing system and has a screen interface capable of displaying graphics in the form of icons, drop-down menus and a movable pointer. The on-screen information is usually controlled / manipulated by a mouse or keyboard.
HSSI	**High Speed Serial Interface**: A differential ECL serial interface standard developed by Cisco Systems and T3plus Networking primarily for use in WAN router connections. It is capable of speeds up to 52 Mbit/s with cables up to 50 feet in length. While HSSI uses 50-pin connector physically similar to that used by SCSI-2, it requires a cable with an impedance of 11 Ω (as opposed to the 75 Ω of a SCSI-2 cable).
IEC	**International Electrotechnical Committee.**
IF	**Intermediate Frequency:** A frequency, commonly 70/140 MHz, to which a carrier frequency is shifted as an intermediate step in transmission or reception. The intermediate frequency is created by mixing the carrier signal with a local oscillator signal, resulting in a signal at the difference frequency.
IP	**Internet Protocol:** The IP part of TCP/IP. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or sub-network. IP accepts packets from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a datagram to the layer 2 data link protocol. It may also break the packet into fragments to support the Maximum Transmission / Transfer Unit (MTU) of the network.
IRD	**Integrated Receiver Decoder:** The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
ISDN	**Integrated Services Digital Network:** The basic ISDN service is BRI (Basic Rate Interface), which is made up of two 64 kbit/s B channels and one 16 kbit/s D channel (2B+D). If both channels are combined into one, called **bonding**, the total data rate becomes 128 kbit/s and is four and a half times the bandwidth of a V.34 modem (28.8 kbit/s). The ISDN high-speed service is PRI (Primary Rate Interface). It provides 23 B channels and one 64 kbit/s D channel (23B+D), which is equivalent to the 24 channels of a T1 line. When several channels are bonded together, high data rates can be achieved. For example, it is common to bond six channels for quality videoconferencing at 384 kbit/s. In Europe, PRI includes 30 B channels and one D channel, equivalent to an E1 line.
ISO	**International Standards Organisation.**
ITU-R	**International Telecommunications Union - Radiocommunications Study Groups** (was CCIR).
ITU-T	**International Telecommunications Union - Telecommunications Standardisation Sector** (was CCITT).

Term	Description
JPEG	**Joint Photographic Experts Group:** ISO/ITU standard for compressing still images. It has a high compression capability. Using discrete cosine transform, it provides user specified compression ratios up to around 100:1 (there is a trade-off between image quality and file size).
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
Ku-band	ITU-defined frequency range from 12 GHz to 18 GHz. Used by communications satellites, this range of frequency is less susceptible to interference.
LAN	**Local Area Network:** A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
L-Band	ITU-defined frequency range from 950 MHz to 2150 MHz. The normal input-frequency-range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.
LCD	**Liquid Crystal Display**. A thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. Often utilized in battery-powered electronic devices because it uses very small amounts of electric power.
LED	**Light Emitting Diode.** A semiconductor diode that emits light when an electric current is applied in the forward direction of the device.
Link Budget	The accounting of all of the gains and losses from the transmitter, through the medium (free space, cable, waveguide, fiber, etc.) to the receiver in a telecommunication system. It accounts for the attenuation of the transmitted signal due to propagation, as well as the antenna gains, feedline and miscellaneous losses. Randomly varying channel gains such as fading are taken into account by adding some margin depending on the anticipated severity of its effects. The amount of margin required can be reduced by the use of mitigating techniques such as antenna diversity or frequency hopping.
LNA	**Low-Noise Amplifier:** A component of a dish antenna that amplifies the weak signals received from a satellite (or microwave transmitter). It is often located very close to, or on, the antenna (immediately behind the feed horn) so that further losses, due to the signal travelling down the feed line, are minimised.
LNB	**Low-Noise Block Down-Converter:** A combination of Low Noise Amplifier (LNA) and a Block Down-Converter (BDC) usually mounted on a dish antenna to enable it to amplify and downconvert the received signal to a suitable frequency to communicate to a Receiver, Demodulator or IRD (typically L-BAND 950 MHz - 1600 MHz).
LNBF	**Low-Noise Block Down-Converter and Feed:** A combination of Low Noise Amplifier, Block Down-Converter and Feed, mounted on a dish antenna.
LO	**Local Oscillator.**
LVDS	**Low Voltage Differential Signal:** LVDS is a generic multi-purpose Interface standard for high speed / low power data transmission. It was standardised in ANSI/TIA/EIA-644-1995 Standard (aka RS-644).
M&C	**Monitor and Control.**

Term	Description
Mbit/s	**Million bits per second.**
MCPC	**Multiple Channels Per Carrier.**
MIB	**Management Information Base:** A type of database used to manage the devices in a communications network. It comprises a collection of objects in a (virtual) database used to manage entities (such as routers and switches) in a network.
MP@ML	**Main Profile at Main Level:** A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MP@HL	**Main Profile at High Level:** A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 80 Mbit/s over various mediums.
MPEG	**Moving Pictures Experts Group:** The name of the ISO/IEC working group which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bit-rates and picture resolutions.
Msymbol/s	(Msym/s) **Mega** (million) **Symbols per second** (10^6 Symbols per second).
Multiplex	A number of discrete data streams (typically 8 to 12), from encoders, that are compressed together in a single DVB compliant transport stream for delivery to a Modulator.
Mux	**Multiplexer:** Transmission Multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation. The Multiplexer also contains the cypher card, which scrambles the services according to the control words supplied by the BCC.
NTSC	**National Television Systems Committee:** The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.
NVOD	**Near Video On Demand:** Method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
ODU	**Outdoor Unit**
OFDM	**Orthogonal Frequency Division Multiplex:** A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.
OPPV	**Order ahead Pay Per View:** An advance purchase of encrypted one-time events with an expiry date.

Term	Description
OQPSK	**Offset Quadrature Phase Shift Keying: A** variant of phase-shift keying modulation using 4 different values of the phase to transmit. It is sometimes called Staggered quadrature phase-shift keying (SQPSK).
OSD	**On-screen display:** Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
PCM	**Pulse Code Modulation:** A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR	**Program Clock Reference:** A time-stamp in the transport stream from which the Decoder timing is derived.
PES	**Packetised Elementary Stream:** A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 kbytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	**Packet Identifier:** The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
PLL	**Phase-Locked Loop.** A phase-locked loop is a control system which controls the rotation of an object by comparing its rotational position (phase) with another rotating object as in the case of a sine wave or other repeating signal. This type of control system can synchronise not only the speed, but also the angular position of two waveforms that are not derived from the same source.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
PS	**Program Stream:** A combination of one or more PESs with a common timebase.
PSK	**Phase Shift Keying:** A method of modulating digital signals particularly suited to satellite transmission.
PSR	**Professional Satellite Receiver:** *See also:* IRD.
PSU	**Power Supply Unit.**
QAM	**Quadrature Amplitude Modulation:** A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.

Term	Description
QPSK	**Quadrature Phase Shift Keying:** A modulation technique used to communicate data over long distances by altering the phase of a carrier signal according to the four data states. Sometimes known as quaternary or quadriphase PSK, 4-PSK, or 4-QAM.
RF	**Radio Frequency.**
RS	**Reed-Solomon coding:** An error detection and correction, coding system. 16 bytes of Reed-Solomon Forward Error Correction code are appended to the packet before transmission bringing the packet length to 204 bytes. The 16 bytes are used at the receiving end to correct any errors. Up to eight corrupted bytes can be corrected.
RLC	**Run Length Coding:** Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character *x y* times'.
RX	**Receive** or **Receiver.**
SCPC	**Single Channel Per Carrier.** Use of a single signal at a given frequency and bandwidth. Most often, this is used on broadcast satellites to indicate that radio stations are not multiplexed as subcarriers onto a single video carrier, but instead independently share a transponder. It may also be used on other communications satellites, or occasionally on non-satellite transmissions
Scrambling	Alteration of the characteristics of a television signal in order to prevent unauthorised reception of the information in clear form.
SDI	**Serial Digital Interface.**
SELV	**Safety Extra Low Voltage (EN 60950).**
STB	**Set-Top Box:** A box that sits on top of a television set and is the interface between the home television and the cable TV company. New technologies evolving for set-top boxes are video-on-demand, video games, educational services, database searches, and home shopping. The cable equivalent of the IRD.
SFN	**Single Frequency Network:** The SFN technique allows large geographic areas to be served with a common transmission multiplex. All transmitters in the network are synchronously modulated with the same signal and they all radiate on the same frequency. Due to the multi-path capability of the multi-carrier transmission system (COFDM), signals from several transmitters arriving at a receiving antenna may contribute constructively to the total wanted signal. The SFN technique is not only frequency efficient but also power efficient because fades in the field strength of one transmitter may be filled by another transmitter.
SNG	**Satellite News-Gathering.**
SNMP	**Simple Network Management Protocol.** A 'layered' protocol used in software applications that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite. SNMP enables network administrators to manage network performance and resolve network problems.

Term	Description
Spectral Scrambling	A process (in digital transmission) used to combine a digital signal with a pseudo-random sequence, producing a randomised digital signal that conveys the original information in a form optimised for a broadcast channel.
TCP / IP	**Transmission Control Protocol/Internet Protocol:** A set of communications protocols used to connect different computers over networks (in particular the internet). TCP/IP consists of four layers: from lowest to highest, these are the Link Layer, the Internet Layer, the Transport Layer, and the Application Layer.
TS	**Transport Stream**. A multiplex of video, audio and data (elementary) streams combined (packetized) into a single synchronous transmission bit stream. It is defined by the MPEG-2 compression and multiplexing standard for the transmission of digital broadcast streams over satellite links, terrestrial networks, and cable networks. These Packetised Elementary Streams (PES) and System Information (SI) streams may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting (DVB) standards.
TX	**Transmit** or **Transmitter.**
U	44.45 mm (rack height standard).
Upconverter	A unit containing the electronic circuitry necessary to transform the carrier frequency of a broadcast transport stream from a low (intermediate) frequency to a high (radio) frequency - suitable for long-distance transmission.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS	**Uninterruptable Power Supply:** A method of supplying backup power when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide battery power for a few minutes; enough to power down the computer in an orderly manner. This is particularly important where **write back cache** is used. Write back cache is where modified data intended for the disk is temporarily stored in RAM and can be lost in the event of a power failure. Sophisticated systems are tied to electrical generators that can provide power for days. UPS systems typically provide surge suppression and may provide voltage regulation.
UTC	**Universal Time Co-ordinate:** An internationally agreed basis for timekeeping introduced in 1972 and based on international atomic time (corresponds to Greenwich Mean Time or GMT).